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Nuclear Science Abstracts

Vol. 6 No. 22
Abstracts 6236-6488
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ERRATA

NSA, Vol. 5, No. 15, p. 631. In the last sentence in abstract 3973, "The experiment on using In research transmission for the analytical determination of In in Sn is completed;" should read: "The experiment on using In neutron absorption resonances for the determination of In in Sn is completed;".

NSA, Vol. 6, No. 8, p. 299. Abstract 2356 should have COO-90 added as cross reference to AECU-1889. Add same reference to report AECU-1889, p. iii.

NSA, Vol. 6, No. 15, p. 543. In title of abstract 4435, "SMALL SMALL-RING" should read: "SOME SMALL-RING". Make same correction in title of report NYO-3582, p. v.

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THE CREATION OF SEXUAL ISOLATION BY ARTIFICIAL SELECTION, by James C. King, Bruce Wallace, and Theodore R. F. Wright. [Aug. 1952.] 17p. (AECU-2215)

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THE USE OF PALLADIUM-109 AS A MULTI-CURIE BETA-RAY SOURCE, by W. W. Meinke, A. H. Emmons, and J. V. Nehemias. [nd] 14p. (AECU-2217)

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NUCLEAR SCIENCE IN ENGINEERING EDUCATION; A SELECTED LIST OF REFERENCES FOR INSTRUCTORS; FIRST REVISION. Simone B. Schwind, comp. Sept. 1952. 17p. (TID-3011(1st Rev.))

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PRECISION SCATTERING PROJECT REPORT NO. II. [ON] EQUIPMENT DESIGN AND PRELIMINARY RESULTS. May 1952. 63p. (NP-4005; Report No. 2)

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[New York State Coll. of Ceramics], Alfred Univ.
A HYDRAULICALLY OPERATED LABORATORY FURNACE WITH RESISTANCE THERMOMETER TEMPERATURE CONTROL; TECHNICAL REPORT, by H. I. Sephton. June 15, 1952. 9p. (NP-4008; U-23463)

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RESEARCH WITH CRYSTAL COUNTERS AND SCINTILLATION COUNTERS (final report), by George Goldsmith and Lee Aukerman. Feb. 13, 1952. 34p. (NP-4012)

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REPORT NO. 33 [FOR] MARCH 1, 1952–MAY 31, 1952 on CERAMIC-METAL BODIES FOR USE AS AIRCRAFT POWER PLANT PARTS SUBJECTED TO ELEVATED TEMPERATURES to FLIGHT RESEARCH LABORATORY. [nd] 10p. (NP-4020)

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SOME EXPERIMENTS ON THE RESISTANCE OF METALS TO FATIGUE UNDER COMBINED STRESSES; PART I AND PART II, by H. J. Gough, H. V. Pollard and W. J. Clenshaw. 154p. (NP-4078; Reports and Memoranda No. 2522; ATI-145915)

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THE DETERMINATION OF URANIUM AND THORIUM IN ORES, by G. G. Eichholz, J. W. Hilborn, and C. McMahon. Aug. 1, 1952. 26p. (NP-4105; TR-99/52)

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CELL DIVISION IN THE GIANT AMOEBA PELOMYXA CAROLINENSIS, FOLLOWING X-IRRADIATION. A. THERAPEUTIC EFFECTS AFTER FUSION WITH EITHER NONIRRADIATED LIGHT OR HEAVY HALVES OF CENTRIFUGED AMOEBAE IMMEDIATELY FOLLOWING EXPOSURE, by Edward W. Daniels. Sept. 1952. 11p. (NP-4124; Report No. 5)

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ON THE PROPERTIES OF GRAPHITE, by John P. Howe. Apr. 1952. 24p. (RL-685)

TEI-244(pt.I) 6355
Geological Survey
GEOPHYSICAL OBSERVATIONS IN PARTS OF THE GRANTS DISTRICT, McKINLEY COUNTY, NEW MEXICO, by Kenneth L. Cook and Calvin K. Moss. Aug. 1952. 13p. (TEI-244 (pt.I))

TEI-247 6356
Geological Survey
RADIOACTIVE TERTIARY PORPHYRIES IN THE CENTRAL CITY DISTRICT, COLORADO, AND THEIR BEARING UPON PITCHBLENDE DEPOSITION, by George Phair. Aug. 1952. 53p. (TEI-247)

TEM-316 6305
Geological Survey
NONINTERFERENCE OF ARSENATE ION IN THE VOLUMETRIC DETERMINATION OF URANIUM USING THE JONES REDUCTOR, by Jack J. Rowe. Oct. 1951. 9p. (TEM-316)

USNRDL-360 6294
Naval Radiological Defense Lab.
THE METABOLISM OF I^{131}-LABELED THYROXINE–STUDIES WITH THE ISOLATED, PERFUSED RAT LIVER, by F. N. Briggs, A. Taurog and I. L. Chaikoff, California Univ., Berkeley. School of Medicine and R. W. Brauer, Naval Radiological Defense Lab. July 21, 1952. 15p. (USNRDL-360)

USNRDL-357 6311
Naval Radiological Defense Lab.
F- AND U-CENTERS IN SOLID SOLUTIONS OF ALKALI HALIDES, by R. A. Levy. Aug. 12, 1952. 13p. (USNRDL-357)

NUCLEAR SCIENCE ABSTRACTS

Vol. 6 November 30, 1952 No. 22

GENERAL

ATOMIC BOMBS AND WARFARE

6236

SUBSTITUTE ATOMIC WARFARE. Jack De Ment. Military Engr. 44, 10-3(1952) Jan.-Feb.

The gross visible phenomena of genuine atomic weapons can sometimes be produced by substitute weapons. An account of just how the various characteristics of a real atomic explosion are simulated is given and the offensive and defensive warfare aspects are discussed.

BIOLOGY AND MEDICINE

6237

Biological Lab., Cold Spring Harbor

THE CREATION OF SEXUAL ISOLATION BY ARTIFICIAL SELECTION, by James C. King, Bruce Wallace, and Theodore R. F. Wright. [Aug. 1952.] 17p. (AECU-2215)

Two laboratory strains of D. melanogaster (Oregon R marked with the recessive straw (stw) and Florida marked with the recessive sepia (se)) were carried in a mixed population through 33 generations. In each generation the percentage of se, stw and wild-type flies was determined; the wild-type flies were discarded, and the next generation set up with equal numbers of virgins of the two recessive strains. In spite of a contamination which brought in double recessive phenotypes from generation 16 on, the percentage of wild-type flies declined significantly during the experiment. Multiple choice tests made with control and population flies as well as tests of the offspring of single females taken from the population indicated a definite change in sexual behavior as a result of the experiment. Taken together, the data support the conclusion that each strain carried within it heritable individual differences in sexual behavior and that selection shifted the mean behavior of the two strains interacting in a mixed population. (auth)

6238

Cancer Research Inst., New England Deaconess Hospital, Boston

RESTING RETICULO-ENDOTHELIAL CELLS AND THEIR "FLUID VACUOLES;" REACTIONS TO POTASSIUM, TONICITY AND ALBUMIN, by Edna H. Tompkins. [nd] 31p. (AECU-2248)

The reactions of cells in connective tissues to P, tonicity, and albumin were observed by means of supravital techniques. Evidence is presented that the so-called resting-wandering cells of the subcutaneous tissue can metamorphose into macrophages.

6239

Lankenau Hospital Research Inst., Philadelphia

METABOLISM OF NEOPLASTIC TISSUE. III. DIPHOSPHOPYRIDINE NUCLEOTIDE REQUIREMENTS FOR OXIDATIONS BY MITOCHONDRIA OF NEOPLASTIC AND NON-NEOPLASTIC TISSUES, by Charles E. Wenner and Sidney Weinhouse. Lankenau Hospital Research Inst., Philadelphia and Institute for Cancer Research, Philadelphia and Temple Univ. [nd] 21p. (AECU-2249)

The oxidation of pyruvate and citric acid cycle components occurs readily and consistently in mitochondria of neoplastic tissues when these are fortified by the addition of DPN in rather high concentration. This DPN requirement cannot be replaced by other known coenzymes or adenine nucleotides. On a per mg nitrogen basis, oxidations by such fortified mitochondria of neoplastic tissues were quantitatively similar to their non-neoplastic counterparts. The suggestion is made that mitochondria of neoplastic tissues do not bind DPN as strongly as certain normal tissues, and that this may result in a correspondingly higher level of this coenzyme in the soluble portion of the cell cytoplasm. It is further suggested that this phenomenon may account for the characteristically high glycolysis rates of intact tumor cells. (auth)

RADIATION EFFECTS

6240

Washington Univ., St. Louis. School of Medicine

EFFECT OF SUB-LETHAL TOTAL BODY X-RADIATION ON SUSCEPTIBILITY OF MICE TO CLOSTRIDIUM SEPTICUM TOXIN, by F. L. Adler and I. L. Schechmeister. [nd] 12p. (AECU-2221)

Total-body exposure to 250 and 350 r reduced the resistance of mice so that animals injected 7 days after irradiation succumbed to approximately one-half the amount of Clostridium septicum toxin which was required to kill non-irradiated control mice. Antitoxin given intramuscularly 6 days after irradiation, and 1 day before challenge with toxin, protected the life of both irradiated and control mice. Irradiated mice required from 1.1 to 2.2 times more antitoxin for their protection than did control animals. The increased antibody requirement of irradiated mice could be explained by the enhanced susceptibility to toxin of these animals. The results indicated that exposure to severe doses of x radiation, in spite of its effects on capillary permeability, apparently fails to significantly raise the minimum amount of antibody required for effective antitoxic prophylaxis. (auth)

6241

Argonne National Lab.

AN ANALYSIS OF THE ROLE OF ELECTROMAGNETIC RADIATIONS IN THE MATING REACTION OF PARAMECIUM BURSARIA, by Charles F. Ehret. Argonne National Lab. and Notre Dame Univ. Aug. 1952. 60p. (AECU-2232; UAC-631)

Diurnal rhythmicity of mating reactivity in chlorella-less or normal animals of Paramecium bursaria, Variety 1, persists under constant conditions in total darkness for as long as a week. Rhythmicity can be shifted by appropriate illumination during sensitive periods. Illumination during the early part of a reactive period causes an increase in reactivity, and during the late part, a decrease. Animals which have been illuminated during a reactive period are more reactive in the next reactive period than animals which have been retained in darkness. Illumination during a nonreactive period causes decreased reactivity in the following period. The action spectrum for increase in reactivity in the early reactive period, with characteristic peaks in the visible at ~450 mμ and in the near ultraviolet at ~365 mμ, suggests that the photoreceptor is a flavin. Increase in reactivity

also follows far ultraviolet and x irradiation, but the differences in exposure time required and in reaction magnitude obtained suggest that the change is mediated through another mechanism. Higher dosages of both ultraviolet and x rays as well as intense flashes of visible light, induce autoagglutination (the sticking together of animals of the same mating type). A working hypothesis is developed relating to the release and production of the mating substance; it is inferred that the former process is increased by illumination, the latter inhibited by it. The possible but highly speculative relations between mating substance and autoagglutination substance are also considered. (auth)

6242

Cancer Research Inst., New England Deaconess Hospital Boston

NUCLEOPROTEIN CHANGES IN THE GASTROINTESTINAL TRACT FOLLOWING TOTAL BODY X-RADIATION, by Frederick W. Tillotson and Shields Warren. [nd] 24p. (AECU-2247)

Cytochemical alterations of DNA, RNA, and alkaline phosphatase occur in the epithelium of the gastrointestinal tract of the rat following total-body x radiation. The cells of the crypts of the small intestine are the most sensitive to x radiation and show distinctive cytochemical modifications during the destructive and reparative phases. The significance of these modifications is discussed. (auth)

6243

Metallurgical Lab., Univ. of Chicago

EFFECTS OF TOTAL-BODY X IRRADIATION ON RATS. II. EFFECTS OF SINGLE AND PERIODIC DOSES ON WEIGHT. A. THE GROWTH OF RATS EXPOSED TO SMALL DAILY DOSES OF X RAYS, by George A. Sacher. July 1952. 20p. (CH-3902)

Immature rats were exposed to daily x-ray dosages of 4, 8, or 16 r for 146 days. Weights were taken daily. The specific effect of irradiation on growth is shown in terms of the difference between logarithms of mean control and experimental weights. At all three dose levels, the specific effect curve has a characteristic form, consisting of a rise to an early peak, subsidence to a minimum, and a final rise to a plateau value that is maintained for many months. The effect of daily irradiation during the course of growth on the weights of selected organs is also reported. The relative weight deficit of an organ in an irradiated animal is correlated positively with the estimated weight gain of the organ over the period of irradiation. Factors that contribute to the observed pattern of changes are discussed. (auth)

6244

Air Force Radiation Lab., Univ. of Chicago

CELL DIVISION IN THE GIANT AMOEBA PELOMYXA CAROLINENSIS, FOLLOWING X-IRRADIATION. A. THERAPEUTIC EFFECTS AFTER FUSION WITH EITHER NONIRRADIATED LIGHT OR HEAVY HALVES OF CENTRIFUGED AMOEBAE IMMEDIATELY FOLLOWING EXPOSURE, by Edward W. Daniels. Sept. 1952. 11p. (NP-4124; Report No. 5)

Pelomyxae were exposed to 70,000 r and then fused to either nonirradiated centripetal or nonirradiated centrifugal halves. The delay in cell division due to x irradiation was essentially prevented. The rate of reproduction was about the same regardless of whether a light or a heavy half was used. Thus rapid recovery in the division rate following exposure to x rays can be brought about in Pelomyxa by adding living protoplasm to each cell. It also shows that the essentially enucleate cytoplasm is as active in this regard as the centrifugal half which contains 96 percent of the nuclei as well as certain cytoplasmic particulates which are not characteristic of the centripetal half. (USAF abst.)

6245

PLASMA ANTIHEMOPHILIC ACTIVITY FOLLOWING TOTAL BODY IRRADIATION. G. D. Penick, E. P. Cronkite, I. D. Godwin, and K. M. Brinkhous. Proc. Soc. Exptl. Biol. Med. 78, 732-4(1951) Dec.

Plasma antihemophilic activity of dogs subjected to total-body irradiation remained at normal levels. Whole hemophilic blood with a full complement of platelets accelerated the clotting of irradiated dog's blood, while platelet-poor hemophilic plasma did not. (auth)

6246

THE EFFECT OF COBALT^{60} GAMMA RADIATION ON ANTIBODY FORMATION AND IMMUNITY. William M. Hale and Richard D. Stoner. Record Med. Gen. Practice Clinics 165, No. 6, 358-60(1952).

Results are presented of a study of the effects of approximately 600 rep/hr γ radiation from a Co^{60} source on antibody production and on immunity in mice exposed to influenza virus, tetanus toxin, pneumococcus, and Trichinella. It was concluded that γ radiation significantly affects the immune mechanisms.

6247

EFFECT OF X-IRRADIATION UPON THE ENZYME SYSTEMS OF THE MOUSE SPLEEN. Gilbert Ashwell and Jean Hickman. Proc. Soc. Exptl. Biol. Med. 80, 407-10 (1952) July.

Total whole-body irradiation of white mice with 640 r (LD_{90} dose) revealed the following changes in the metabolism of spleen homogenates: (1) no effect upon the activity of the succinoxidase system, (2) marked increase in activity of alkaline phosphatase which was especially marked with ATP as substrate, and (3) decreased ability to synthesize (or maintain) the high energy phosphorus compounds coupled with the oxidation of succinate. (auth)

6248

ROLE OF EXTERNALLY PRODUCED HYDROGEN PEROXIDE IN DAMAGE TO PARAMECIUM AURELIA BY X RAYS. R. F. Kimball and Nenita Gaither. Proc. Soc. Exptl. Biol. Med. 80, 525-9(1952) July.

An abstract of this material was indexed as AECU-2032 and appears in Nuclear Science Abstracts as NSA 6-3892.

6249

FACTORS INFLUENCING DEVELOPMENT OF HYPOPHYSEAL TUMORS IN MICE AFTER TREATMENT WITH RADIOACTIVE IODINE. Aubrey Gorbman. Proc. Soc. Exptl. Biol. Med. 80, 538-40(1952) July.

Radiation thyroidectomy (under specified dietary conditions) with smaller amounts of I^{131} is not followed by pituitary tumors in C_{57} mice. Such radiation thyroidectomy with larger quantities of I^{131} is followed by pituitary tumors. Thyroid implants or adequate thyroxine dosages prevent appearance of the pituitary tumors after suitable I^{131} treatment. Similar implantation of pituitary, ovarian, or adrenal tissue in treated mice does not prevent growth of the tumor. It is concluded that the radiation thyroidectomy is a necessary, but not the sole factor, leading to growth of the pituitary tumor in I^{131}-treated mice. It appears likely that another factor, related to the ionizing radiation itself, may be an influence aggravating or synergizing the thyroidectomy in its tumorigenic action on the pituitary gland of the mouse. (auth)

6250

BLOOD-CLOTTING STUDIES ON DOGS INTERNALLY IRRADIATED WITH RADIO-GOLD. John H. Ferguson, G. A. Andrews, and Marshall Brucer. Proc. Soc. Exptl. Biol. Med. 80, 541-5(1952) July.

Internal irradiation with Au^{198}, in sufficient dosage and after several days' latency, induces a blood coagulation defect of which the prothrombin consumption test is a

sensitive index. By using this test through the course of the irradiation, the 2-stage values seem to reflect, with some accuracy, the severity and probable outcome of the radiation injury. Similar data are becoming available in several animal species (including man) and with various types of irradiation. (auth)

6251
WHOLE BODY X-IRRADIATION OF OBESE MICE. Willie W. Smith, W. H. Chapman, and F. M. Alderman. Am. J. Physiol. 169, 511-14(1952) June.

Mice made fat by goldthioglucose injection and mice with hereditary adiposity had the same incidence of death following whole-body x irradiation as litter-mate controls of normal size. Survival time and weight loss after radiation were essentially the same in fat as in control mice, while in nonirradiated starved mice survival time and total weight loss were about three times as great in the obese mice as in their controls. These results strongly suggest that starvation is not responsible for death in mice following radiation either in the range where survival time is 9 to 14 days (500 r) or 3.5 to 4 days (2000 r). (auth)

6252
EFFECTS OF RADIATIONS OF RADIOACTIVE PHOSPHORUS ON CELL DIVISION IN ROOT MERISTEM. R. G. Trudova. Doklady Akad. Nauk S.S.S.R. 85, 219-20(1952) July 1. (In Russian)

The number of cell divisions in the root meristem of 48-hr wheat seedlings following transfer to aqueous P^{32} solutions of specific activities up to 20 μc/ml is plotted for exposures of 24, 48, and 72 hr.

6253
EFFECTS OF FAST NEUTRONS UPON FOREST TREE SEEDS. II. RELATIONS BETWEEN THE INTENSITIES OF IRRADIATIONS AND THE GERMINATIONS OF SEEDS, THE GROWTH OF SEEDLINGS OF PINUS DENSIFLORA. Keiji Satō and Yoshio Nishina. Sci. Bull. Faculty Agr. Kyushu Univ. 13, 238-42(1951) Nov. (In English)

Seeds of Pinus densiflora were exposed for 5 to 120 min to neutrons produced by bombarding Be with 2.8- to 3-Mev deuterons from the Institute of Physical and Chemical Research cyclotron (this work was carried out in 1943). Neutron intensities are expressed in arbitrary units. The percentages of germinations, the survival rates, and the growth of seedlings were found to be better in the classes exposed at certain doses than in the controls. Exceeding these limits, the percentages of germinations, the survival rates, and the growth of seedlings were inversely proportional to the doses of radiations. Pine seeds soaked in tap water for 1 to 3 days were more susceptible to neutron-irradiation damage than were dry seeds.

6254
ROENTGEN RAY CANCER OF THE HANDS IN DENTISTS. Frederic E. Mohs. J. Am. Dental Assoc. 45, 160-4(1952) Aug.

The exposure of the thumb and first two fingers of dentists from the repeated holding of dental films in the mouths of their patients may lead to radiation damage. This may be manifested by dryness, scaliness, fissuring, ulceration, telangiectasis, atrophy, keratoses and squamous cell carcinoma. Prevention is effected by scrupulous avoidance of exposure. Treatment of the dryness and scaliness is by the sparing use of oily lotions or creams. Fissures, abrasions and ulcerations are treated by producing a crust with Mercurochrome, by dry protective dressings or by scarlet red ointment-impregnated gauze dressings. Keratoses may be treated by electrodesiccation or by chemical cauterization, preferably with microscopic examination if there is any suspicion of malignancy. Cancer may be treated with surgical, electrosurgical or chemosurgical intervention. The last method with its complete microscopic control of excision has the advantages of unprecedented reliability and maximal conservation. Treatment with radium or x rays is contraindicated. (auth)

6255
THE RELEASE AND IDENTIFICATION OF BLOOD BORNE VASOTROPIC SUBSTANCES AFTER WHOLE BODY IRRADIATION. Thomas J. Haley. Trans. N.Y. Acad. Sci. 14, 303-5(1952) June.

Following whole-body irradiation of rats and dogs, release was demonstrated of a circulating toxic substance which causes a profound peripheral vascular depression. This material, which appears during the first post-irradiation week, was shown to fit the criteria established for ferritin, a substance which has been shown to be involved in the irreversible phase of shock. The vasoexcitor material appearing in the blood of x-irradiated rats during the second post-irradiation week was shown to fit the criteria established for the vasoexcitor material which appears during the reversible phase of shock.

6256
FURTHER STUDIES ON METASTASIS OF A TRANSPLANTABLE MOUSE MAMMARY CARCINOMA AFTER ROENTGEN IRRADIATION. Carl F. Von Essen and Henry S. Kaplan. J. Natl. Cancer Inst. 12, 883-92(1952) Feb.

A series of five experiments concerning the frequency of pulmonary metastasis in strain C57 mice bearing Bagg-Jackson mouse mammary carcinoma 755 are reported. It is concluded that the effect of irradiation on metastasis of this tumor involves a transient local disturbance of the host-tumor relationship, probably concerned with facilitating entry of tumor cells into blood vessels.

6257
SCARS REMAINING IN ATOM BOMB SURVIVORS; A FOUR YEAR FOLLOW-UP STUDY. Warner Wells and Neal Tsukifuji. Surg. Gynecol. Obstet. 95, 129-41(1952) August.

A resurvey was made after four years of persons surviving burns or other wounds incident to atom bomb explosions in Hiroshima and Nagasaki. From results of the survey the authors conclude that the clinical course of burns and other injuries in 28 patients who gave a history of acute radiation illness after atom bomb detonations has not differed significantly from the clinical course of 35 injured at the same time but without a history of radiation illness. No case was discovered which resembled a cutaneous radiation injury.

6258
GENETIC IMPLICATIONS OF MUTATIONS IN S. TYPHIMURIUM. H. H. Plough. In Heterosis. John W. Gowen, ed. Ames, Iowa State College Press, 1952. (Chapter 17).

Results are reported of a study of the effects of x irradiation on two strains of Salmonella typhimurium, and the isolation of strains with specific nutrilite requirements. Successive tests show a relation between x-ray dosage and the percentage of recovered auxotrophic mutants, and also between dosage and the number of different mutants. Tests to determine if antigenic specificity is altered by radiation were negative.

6259
THE EFFECT OF X-RAYS, ADRENAL CORTEX HORMONES AND OTHER REAGENTS ON NORMAL AND MALIGNANT LYMPHOCYTES IN VITRO. Robert Schrek. Acta Unio Intern. Contra Cancrum 7, 868-73(1952).

Suspensions of living cells from rat lymphosarcoma, reticulum cell sarcoma, and Walker tumor 256; from rat and rabbit thymus; from blood from normal persons and patients having lymphatic leukemia and myelogeneous leukemia; and from rabbit bone marrow and rat testis were compared for their in vitro reactions to incubation, 1000-r x radiation, 2,6-dichlorophenol indophenol, and adrenal cortex hormones. Results are presented in tabular form.

6260

THIRD GENERATION FOLLOW-UP IN WOMAN RECEIVING PELVIC IRRADIATION. I. C. Rubin. J. Am. Med. Assoc. 150, 207-9(1952) Sept.

Genetic effects of x irradiation are discussed. Case histories are reviewed of women who received low-dosage pelvic irradiation while non-pregnant and who are the mothers and grandmothers of normal children.

6261

SUPPRESSION OF THE TUBERCULIN REACTION IN RABBITS BY TOTAL BODY IRRADIATION WITH X RAYS. B. Lennox, W. J. Dempster, and J. W. Boag. Brit. J. Exptl. Path. 33, 380-9(1952) Oct.

Irradiation of a rabbit at or near the time of inoculation with tubercle bacilli delays the appearance of the positive intradermal tuberculin reaction. Irradiation of the tuberculin-sensitive rabbit temporarily renders this reaction negative or markedly weaker. Local screening does not alter this effect. The histology of the tuberculin reaction sites, and the timing of the process, suggest that the suppression is the result of overproduction of cortisone under the stimulus of irradiation. (auth)

6262

CATALASE POISONS IN RELATION TO CHANGES IN RADIOSENSITIVITY. E. Boyland and E. Gallico. Brit. J. Cancer 6, 160-72(1952) June.

A list of catalase poisons including some hitherto unknown poisons is given, and the concentration required for 50% inhibition of catalase is compared with the lethal dose for mice. Azide and hydroxylamine are the most specific of known catalase poisons. The poisoning with azide increases with decrease in pH so that the concentration of undissociated hydrazoic acid required for 50% inhibition remains constant. The poisoning by hydroxylamine and hydrazine is almost independent of pH. The poisoning of catalase is considered in relation to these findings that hydrazoic acid and formic acid act as undissociated molecules. The possibility that poisons of this type are effective because of their structural resemblance to hydrogen peroxide is discussed. Poisoning of catalase of liver and tumor of rats was demonstrated after injection of azide. Injection of small doses of azide or hydroxylamine into rats immediately before x irradiation did not increase the radiosensitivity of tumors. Injection of large doses of azide or hydroxylamine into mice before irradiation reduced the mortality from x irradiation of the whole body. (auth)

6263

THE INACTIVATION OF DRY PENICILLIN BY DEUTERON BOMBARDMENT. Marguerite Davis and Ernest Pollard. Arch. Biochem. Biophys. 37, 112-16(1952) May.

Dry penicillin is inactivated by deuterons if bombarded very heavily. Assuming that the random arrival of one primary ionization inactivates the molecule an inactivation volume of 700 A^3 is found. The actual molecular volume is 400 A^3. The inactivation volume is thought to be too large because of action of the various forms of energy in a primary ionization on more than one molecule. (auth)

6264

SOME OBSERVATIONS ON EFFECT OF GAMMA RADIATION ON THE BIOCHEMISTRY OF THE RAT THYMUS. John F. Thomson, Wallace W. Tourtellotte, and Magdalene S. Carttar. Proc. Soc. Exptl. Biol. Med. 80, 268-72(1952) June.

Negligible changes were observed in the activities of succinic dehydrogenase, malic dehydrogenase, cytochrome oxidase, and adenosine triphosphatase in a thymus homogenate prepared from a rat exposed to 800 r of gamma radiation; however, pronounced diminution both in concentration and in P^{32} incorporation of thymus DNA, and to a lesser extent RNA, were evident 3 hours after exposure of the rat, and became progressively greater during a 96-hour post-irradiation interval. The capacity of a thymus homogenate to esterify inorganic phosphate was appreciably diminished in the irradiated rat. It is suggested that the diminished respiration observed in slices of thymus from irradiated rats is not a primary radiation effect, since comparable changes do not occur in the activity of individual respiratory enzymes studied here. (auth)

6265

A RARE DOMINANT CHLOROPHYLL MUTANT IN DURUM WHEAT. Luther Smith. J. Heredity 43, 125-8(1952) May - June.

A chlorophyll chimera was found in a plant of durum wheat which was grown from a seed exposed to the Test Able atomic bomb. In subsequent selfed generations of heterozygous plants approximately ¾ of the offspring were self-colored yellow green—changing to a golden color. When heterozygous golden plants were reciprocally crossed with normal plants, half of the F_1's were golden and half were normal. When homozygous golden plants were crossed reciprocally with normal plants, all of the F_1's were golden. It was concluded that the golden character was the result of an induced dominant mutation. The gene symbol *Go* for the mutant has been proposed and accepted. (auth)

6266

INDIRECT EFFECTS OF X RAYS ON CHROMOSOMES. G. Bonnier. Brit. J. Radiology, 25, 180-2(1952) April.

Work is reviewed which has been completed to date on the induction of mutations in Drosophila by indirect x irradiation.

6267

EXPERIMENTAL RADIOTHERAPY OF ABDOMINAL CANCER. I. FACTORS AFFECTING RADIATION TOLERANCE OF THE ABDOMEN IN THE RAT. Lionel Cohen and Annabelle Cohen. Brit. J. Radiology 25, 485-90(1952) Sept.

It has been shown that the systemic effects of radiation are dependent, not only on the physical integral dose, but also on the anatomical zone treated. For an adequate description of these effects, one has to take into account the average tissue dose, the treated mass, the relative biological efficiency (η) of the radiation, the specific radiosensitivity (ρ) of the zone treated, and the body weight. A formula relating these factors is suggested. The median lethal doses for rats treated through various fields were estimated and compared by means of an experimental technique whereby sufficient information for this purpose could be obtained with the minimal wastage of animals. From these data it appears that the abdomen has a specific sensitivity 1.47 times greater than the average for the body as a whole. This factor will have to be taken into account in any attempt at radiotherapy of abdominal cancer. (auth)

6268

CYTOGENETICAL STUDIES ON THE STERILE WILD SENNA (CASSIA TORA L.) PRODUCED BY ATOMIC BOMB EXPLOSION. I. MORPHOLOGICAL OBSERVATIONS ON THE ASYNAPTIC STERILE PLANT. Taira Sugimoto. Sci. Bull. Faculty Agr. Kyushu Univ. 13, 14-19(1951) Nov. (In Japanese)

Morphological observations were conducted on the asynaptic plant found in the progenies of wild senna (Cassia tora L.) collected in Nagasaki after the atomic bomb explosion in 1945. It is difficult to distinguish morphologically the asynaptic plant from the normal one in the early stage of the growth, but easy after flowering. Although there is no significant difference in height between the normal and the asynaptic plant nor in the mean number of placentas per pod or length of guard cells of stomata, a remarkable difference is recognized between the normal and the asynaptic plant in the mean number of branches per plant and seeds

per pod. Germination percentage of the seeds produced from the normal and the asynaptic plant was 76.2 and 22.4, respectively. (Table titles, illustration captions, and references are in English.)

RADIATION HAZARDS AND PROTECTION

6269
Radiation Lab., Univ. of Calif., Berkeley
MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] JANUARY, FEBRUARY, AND MARCH, 1952. [nd] Decl. Oct. 1, 1952. 70p. (AECD-3448; UCRL-1826)

Separate abstracts have been prepared on two sections of this report.

6270
Radiation Lab., Univ. of Calif., Berkeley
BIOLOGICAL STUDIES OF RADIATION EFFECTS, sect.II of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT, JANUARY, FEBRUARY, AND MARCH, 1952. [nd] Decl. Oct. 1, 1952. 18p. (AECD-3448(sect.II); UCRL-1826(sect.II))

The urinary excretion of C^{14} in patients given 100 μc of C^{14}-methylene-labeled glycine was investigated and data on the radiation dosage received by these patients are included. Evidence is presented of substances which were obtained from mashes and extracts of rapidly growing tissue and which stimulated the formation of desoxypentose nucleic acid, offering some protection when injected after exposure to radiation.

6271
INSTRUMENTS FOR MEASURING SECONDARY RADIATION. Willard W. Van Allen. Arch. Ind. Hyg. Occupational Med. 6, 124-7(1952) Aug.

A self-contained, integrating type of radiation meter is described which is sensitive enough to provide readings for single, normal exposures in those shielded areas usually occupied by operating personnel in diagnostic x-ray installations.

6272
HOW TO SURVEY A STREAM FOR RADIOACTIVE SUBSTANCES. O. W. Kochtitzky and O. R. Placak. Public Works 83, 76-8, 114-16(1952) June.

Problems encountered in surveying streams for radioactivity are outlined, and methods are suggested for meeting these problems.

6273
AN ANALYSIS OF THE DANGERS OF X-RAY IRRADIATION. James A. English. Dental Radiog. and Photog. 25, 1-7 and 20(1952).

Hazards to the patient and the operator which may exist in dental radiography when the personnel involved are not aware of the consequences of overexposure to x rays are discussed. Harmful effects of radiation are reviewed and precautions are suggested to be taken for the prevention of overexposure.

6274
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. II. EFFECT OF CORTISONE ON X-RAY MORTALITY OF MICE. Friedrich Ellinger. Proc. Soc. Exptl. Biol. Med. 80, 214-17(1952).

Administration of 0.25 mg cortisone intramuscularly to mice daily for 14 days after their exposures to the LD_{60} and 25/14 days of x rays resulted in a definite increase of the mortality rates produced by these x-ray doses. There was no increase in mortality in the cortisone-treated mice exposed to the minimal lethal dose of x rays but as in the higher x-ray doses, cortisone treatment produced a shortening of the latent period between irradiation and onset of death, indicating an adverse effect even at this low radiation level. Simultaneous treatment of irradiated mice with cortisone and ascorbic acid did not modify the enhancement of the radiation-induced mortality rate produced by the cortisone administration. Some clinical implications of these animal experimental data are briefly mentioned. (auth)

6275
ROENTGEN DOSES DURING DIAGNOSTIC PROCEDURES. Vern W. Ritter, S. Reid Warren, Jr., and Eugene P. Pendergrass. Radiology 59, 238-51(1952) Aug.

Curves and formulas are given by means of which skin, depth, and integral doses of x radiation resulting from diagnostic radiological procedures can be estimated.

6276
ALTERATION OF THE MORTALITY OF ROENTGEN IRRADIATED MICE BY CHEMICAL MEANS. G. Limperos. Am. J. Roentgenol. Radium Therapy Nucl. Med. 67, 810(1952) May.

The mortality of x-irradiated mice was found to be altered by chemical agents capable of influencing the generation of free radicals from cellular water such as sulfhydryl compounds, sulfhydryl inhibitors, and oxygen. Thiourea (2250 mg/kg) injected intraperitoneally before x irradiation was found to decrease the mortality of mice irradiated with 450, 500, and 600 r. This protective effect was enhanced when the thiourea dose was increased up to 4000 mg/kg. Thiourea injected after irradiation failed to protect mice against irradiation. The protective effect of thiourea was diminished when folic acid was injected at the same time as thiourea and also administered in the drinking water after irradiation. Thiouracil, although it contains a free sulfhydryl group, did not protect mice when injected intraperitoneally before irradiation. Sodium maleate injected intraperitoneally before irradiation increased the mortality of mice, possibly because the sulfhydryl-containing constituents of the tissues were lowered by interaction with sodium maleate. A 10% oxygen concentration during irradiation was found to decrease the mortality of x-irradiated mice, whereas a 100% oxygen concentration was found to increase mortality although not to a significant degree. When the oxygen concentration of the atmosphere was changed after irradiation, the mortality was not changed significantly. The results are discussed in relation to the indirect mechanism theory for the action of x irradiation in vivo. Their possible significance in radiation therapy is also discussed. (auth)

6277
CYTOLOGICAL INVESTIGATION OF BONE MARROW OF MICE AFTER ADMINISTRATION OF PROTECTIVE AGENTS AND SUBSEQUENT X RADIATION. Finn Devik. Brit. J. Radiology 25, 481-4(1952) Sept.

Mice were exposed to 200-r total-body x radiation, and the frequency of chromosome injuries induced by radiation in the bone marrow was determined. The effects of preradiation administration of cysteine, glutathione, thiocholine, thiourea, ascorbic acid, methylene blue, vitamin B_1 on the frequency of chromosome abnormalities were studied. There was no significant reduction in chromosome injury with these substances. Mice were irradiated under hypoxia, and the amount of chromosome injuries was reduced as compared with the control. It is concluded that the protective effect of cysteine and other substances, which reduce mortality rate after radiation, is exerted in the cytoplasm, while that of hypoxia may be more specifically restricted to the chromosome mechanism. (auth)

RADIATION SICKNESS

6278
MODIFICATION OF ACUTE IRRADIATION INJURY IN MICE AND GUINEA PIGS BY INJECTION OF BONE MARROW; A HISTOPATHOLOGIC STUDY. Charles C. Congdon, Delta Uphoff, and Egon Lorenz. J. Natl. Cancer Inst. 13, 73-108 (1952) Aug.

A survey of the literature on therapy with bone marrow in man revealed many conflicting reports on its effectiveness in blood dyscrasias. Evidence for a humoral effect on hematopoietic tissue by bone-marrow preparations exists, but its clinical value is unproved. A survey of some of the older work on experimental animals revealed conflicting reports on the existence of a humoral factor. The most recent work on bone-marrow injections in irradiated animals shows a definite beneficial effect. A histopathologic study of irradiated animals treated with bone-marrow injections revealed that destructive action of x irradiation on hematopoietic tissues was unaltered, but that regeneration of these tissues was greatly enhanced and was responsible for their recovery from the acute irradiation injury. The main theories of action of bone-marrow suspensions are reviewed and evidence for and against the "cellular repopulation" and "tiding over" theories presented. Some of the lines of investigation relative to the "humoral" theory are presented. Clinical trial of living bone-marrow suspensions along with other measures in the acute irradiation syndrome in man are suggested. Similarly clinical trials in other situations in which hematopoietic tissues are rapidly destroyed can be supported by these and other experimental studies. (auth) 111 references.

6279

ADVERSE EFFECT OF CORTISONE ON MARROW REGENERATION FOLLOWING IRRADIATION. John B. Thiersch, Loretta Conroy, Alexander R. Stevens, Jr., and Clement A. Finch. J. Lab. Clin. Med. 40, 174-81(1952) Oct.

A study of the effect of a biologically effective dose of cortisone on marrow regeneration of rats exposed to 200-r whole-body irradiation showed that, under the conditions of the experiment, cortisone had a retarding effect on the regeneration of blood-forming tissues.

RADIOGRAPHY

6280

CHEST RADIOAUTOGRAPHY. William M. Loehr. Am. J. Roentgenol. Radium Therapy Nucl. Med. 68, 355-9(1952) Sept.

A technique is described for preparing radioautographs of the entire chest following administration of a therapeutic dose of I^{131}. The value of the technique is illustrated by the case history of a patient with a history of arrested tuberculosis and who had previously undergone hemithyroidectomy at which time a portion of densely adherent tumor mass was removed. I^{131} uptake by the lungs as shown by radioautograph was of value in the differential roentgen diagnosis of pulmonary lesions and provided topographical localization of metastatic lesions in the chest.

RADIOTHERAPY

6281

TREATMENT OF CARCINOMA OF THE PROSTATE BY INTERSTITIAL RADIATION WITH RADIO-ACTIVE GOLD (Au198); A PRELIMINARY REPORT. R. H. Flocks, H. D. Kerr, H. B. Elkins, and D. Culp. J. Urol. 68, 510-22(1952) Aug.

Preliminary experiences with interstitial radiation for carcinoma of the prostate using radioactive isotope Au^{198} in 20 cases have been described. (auth)

6282

A QUANTITATIVE DOSE-RESPONSE STUDY OF LYMPHOID-TUMOR DEVELOPMENT IN IRRADIATED C57 BLACK MICE. Henry S. Kaplan and Mary B. Brown. J. Natl. Cancer Inst. 13, 185-208(1952) Aug.

Lymphoid-tumor incidence, latent period, and organ distribution were studied in 1,753 strain C57 black mice of both sexes, 1 month old at the start of treatment, randomized by litters into 35 groups, given a graded sequence of total-body x-ray doses in single exposures or 2, 4, or 8 equal fractions at intervals of 1, 4, 8, or 16 days. Results are summarized.

6283

RADIATION DOSAGE IN THE USE OF RADIOACTIVE ISOTOPES. James S. Robertson. Record Med. Gen. Practice Clinics 165, 340-5(1952) June.

Formulas are given for the calculation of dosage rates of radiation received by the tissues in either tracer or therapeutic applications. Applications of the formulas vary from isotope to isotope, chiefly because of the variations in what is known or has to be assumed regarding the metabolism of the isotope.

6284

THE USE OF BETA RADIATION ON CORNEAL LESIONS IN THE DOG. Francis T. Candlin and Morris H. Levine. North Am. Veterinarian 33, 632-96(1952) Sept.

The Sr^{90} plaque offers a convenient effective means of applying beta radiation for certain corneal lesions. Dosages greatly in excess of early reports have been successfully used. Vascular diseases of the cornea, pterygium, and keratitis pigmentosa dramatically respond to this treatment. When properly applied the Sr^{90} plaque offers a large margin of safety to patient and doctor, without danger of cataract formation. (auth)

6285

EFFECT OF BIOFLAVONOIDS ON RADIOSENSITIVITY OF TRANSPLANTED TUMORS; EFFECT ON TOLERANCE TO CONTACT RADIATION. Boris Sokoloff, Walter H. Eddy, and George Cone. Arch. Path. 54, 197-203(1952) Aug.

The flavonoid compound when given in a total dose of 280 mg/100 g to rat bearers of Sarcoma 39 or Crocker carcinoma, of an average tumor diameter of 17 to 20 mm, which were submitted to a single dose of 6000, 10,000, 12,000, or 15,000 r contact radiation, respectively, did not decrease the radiosensitivity of the cancer tissue. The flavonoid compound when administered in the same total dose to the rats *after* they had been exposed to a single dose of 15,000 r contact radiation exerted only slight, if any, protective action against radiation injury. The mortality rate for this group of rats was 66% against 82% of the control group of irradiated rats. The dose, when administered *before* exposure to a single dose of 15,000 r contact radiation gave considerable protection against radiation injury. The mortality rate for this group of rats was 42% against 86% of the controls. The dose, when given for 7 days prior to and 21 days after exposure to a single dose of 15,000 r contact radiation brought down the mortality rate to 28% against 74% for the controls. The possible relation between the biological activity of flavonoids and the stress reactions induced by radiation is discussed.

6286

THE EFFECTS OF SODIUM IODIDE, 6-PROPYLTHIOURACIL, AND 1-METHYL-2-MERCAPTOIMIDAZOLE DURING RADIOIODINE THERAPY OF HYPERTHYROIDISM. Howard B. Hamilton and Sidney C. Werner. J. Clin. Endocrinol. and Metab. 12, 1083-94(1952) Aug.

Four groups of thyrotoxic patients have been treated with therapeutic doses of radioactive iodine. Three of the groups have been given, in addition, either sodium iodide, 6-propylthiouracil, or 1-methyl-2-mercaptoimidazole for a two-week period commencing one week after administration of radioiodine. An early and significant reduction in the serum precipitable iodine level has been induced by 1-methyl-2-mercaptoimidazole but not by sodium iodide or propylthiouracil. Clinical improvement has been noted with sodium iodide and with 1-methyl-2-mercaptoimidazole administration several weeks before an effect from radiation with

radioiodine could have been expected. No such benefit resulted from 6-propylthiouracil. The percentage of patients achieving remission from a single dose of isotope may have been reduced, and the total dosage of I^{131} required to induce remission increased, as a consequence of the supplementary medication. Only borderline statistical significance can be attributed to this finding. The effective half-life of the isotope within the thyroid has been unaltered by the iodides or antithyroid drugs used in this study despite the different mechanisms of action upon the gland. (auth)

6287

THE THERAPEUTIC USE OF THE RADIOACTIVE ISOTOPES IN INTRACRANIAL TUMORS. Loyal Davis and Stanton L. Goldstein. Ann. Surg. 136, 381-91(1952) Sept.

Gelfoam or starch sponge, impregnated with therapeutic doses of radioactive colloidal gold (Au^{198}) or chromic phosphate (P^{32}), was implanted intracerebrally in 50 healthy adult cats. There was destruction of a narrow band of tissue, extending 1 to 3 mm away from the site of implantation. After several weeks there was repair and regeneration in this necrotic band. There was no appreciable difference between the effects of colloidal gold and those of chromic phosphate. Phosphorus is easier to handle and can be used with less risk of excessive irradiation to the surgeon. Except for the necrosis in early cases, there was no particular difference between the effect of the radioactive isotopes and the controls consisting of plain Gelfoam and starch sponge and non-radioactive suspensions of colloidal gold and chromic phosphate. There were no demonstrable histopathologic effects beyond approximately 3 mm, nor were there any in other parts of the central nervous system or in more distant organs. (auth)

6288

THE USE OF RADIOACTIVE COLLOIDAL GOLD (AU^{198}) IN PLEURAL EFFUSIONS AND ASCITES ASSOCIATED WITH MALIGNANCY. E. R. King, Donald W. Spicer, F. William Dowda, Merrill A. Bender, and William E. Noel. Am. J. Roentgenol. Radium Therapy Nucl. Med. 68, 416-20(1952) Sept.

Radioactive colloidal gold is appropriate for treatment of patients with pleural effusion or ascites associated with malignancy, because of its half life, its emissions, and the size of the colloidal particles. This is a report of sixteen cases treated with this material. Twenty-five per cent of the patients experienced marked relief, both from the standpoint of the reduction of fluid accumulation and relief of pain. Twenty-five per cent experienced moderate relief of these symptoms and the results in the remaining 50 per cent varied. From the results of this study it is apparent that the intracavitary use of radioactive colloidal gold should be accepted as a valid radiotherapeutic procedure. (auth)

6289

TECHNIQUES AND RADIATION PRECAUTIONS FOR INTRATUMOR INJECTIONS WITH RADIOACTIVE COLLOIDAL GOLD. H. Brownell Wheeler, Jack H. Rubenstein, M. Donald Coleman, and Thomas W. Botsford. Arch. Surg. 65, 283-9(1952) Aug.

It is possible to localize radiation within tumors by the direct intratumor injection of radioactive colloidal gold. Methods and equipment are described which permit the dispersion of a calculated dose of this isotope within a tumor with minimal radiation hazard to surgeon, patient, and nursing personnel. (auth)

TOXICOLOGY STUDIES

6290

Argonne National Lab.

THE FATE AND PATHOLOGIC EFFECTS OF PLUTONIUM METAL IMPLANTED INTO RABBITS AND RATS, by Hermann Lisco and Walter E. Kisieleski. Aug. 1952. 28p. (AECU-2236; UAC-622)

Plutonium metal was implanted subcutaneously in rabbits and rats. The metal pieces disintegrated into many small fragments soon after introduction into the tissues. They were found to be relatively inert locally and only small amounts of plutonium were absorbed from the implants in an observation period extending up to 1048 days. The implantation sites became heavily calcified in the course of time. Retention, organ distribution and excretion studies are reported. The majority of the animals appeared to suffer no ill effects either from the local implants or from the absorbed plutonium, although one rat died with an osteogenic sarcoma of the spine produced by the deposition of plutonium in the skeletal tissues. (auth)

6291

Radiation Lab., Univ. of Calif., Berkeley

THE METABOLIC PROPERTIES OF VARIOUS MATERIALS, sect.I of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT, JANUARY, FEBRUARY, AND MARCH, 1952. [nd] Decl. Oct. 1, 1952. 44p. (AECD-3448(sect.I); UCRL-1826 (sect.I))

Tissue distribution of fission products obtained from Oak Ridge were determined in rats and data are presented in tabular form. A decay curve and mass absorption curve for the fission products used are included. Studies on the effect of Ca ethylenediamine tetraacetic acid on the distribution of Pu in the rat indicate that the oral administration of CaEDTA is not a particularly efficient way of reducing the Pu content of the tissues, and large amounts of CaEDTA must be given parenterally during the time the Pu is in a relatively labile state in the body for increase of excretion to be marked. An ether extraction method is reported for the separation of U from mixed fission products. Studies on the products resulting from irradiation of aqueous solutions of acetic acid are reported. Design of a calorimeter for determination of the cyclotron He ion beam energy is described. A diagramatic arrangement of the calorimeter assembly is included. Photographs and stripping-film radioautographs of rat lungs after exposure to a smoke containing Pu are presented. A technique is described for preparing radioautographs using a film similar to stripping film but consisting of emulsion and an inert layer of gelatin which allows staining of the tissue through the wet gelatin. This film, supplied for experimentation by Eastman Kodak Company, gave improved radioautographs. Possible applications of the method to additional studies of the fate of inhaled particulate matter are discussed.

TRACER APPLICATIONS

6292

Northwestern Univ. Medical School

EFFECT OF LOW PROTEIN DIET AND STARVATION ON NUCLEIC ACID METABOLISM IN THE RAT, by John A. D. Cooper. [nd] 9p. (AECU-2228)

The effect of diet and starvation on the content and rate of incorporation of radiophosphorus in the nucleic acids of rat liver, kidneys, spleen, duodenum and jejunum was investigated. Results are presented in tabular form.

6293

Atomic Energy Medical Research Project, Western Reserve Univ.

USE OF I^{131}-LABELED PROTEIN IN THE STUDY OF PROTEIN DIGESTION AND ABSORPTION IN CHILDREN WITH AND WITHOUT CYSTIC FIBROSIS, by Paul S. Lavik, LeRoy W. Matthews, G. W. Buckaloo, Samuel Spector, and Hymer L. Friedell. Atomic Energy Medical Research Project, Western Reserve Univ. and Western Reserve Univ. School of Medicine. Issued Aug. 15, 1952. 19p. (NYO-4025)

A method is described for evaluating protein digestion and absorption by measuring the fecal excretion of isotope after the administration of a test meal of I^{131}-labeled protein. Data are presented from application of this method to 10 children without gastrointestinal disease and to 5 with cystic fibrosis of the pancreas.

6294

Naval Radiological Defense Lab.

THE METABOLISM OF I^{131}-LABELED THYROXINE – STUDIES WITH THE ISOLATED, PERFUSED RAT LIVER, by F. N. Briggs, A. Taurog and I. L. Chaikoff, California Univ., Berkeley. School of Medicine and R. W. Brauer, Naval Radiological Defense Lab. July 21, 1952. 15p. (USNRDL-360)

Thyroxine is excreted in the bile largely in the form of a compound differing from the original material. Experiments in which I^{131}-labeled L-thyroxine was administered to isolated perfused rat livers were undertaken to ascertain whether the transformation of thyroxine to the compound found in bile takes place in the liver itself, or whether this transformation occurs elsewhere and the transformed material is merely taken up and excreted by the liver. Chromatographic analyses of bile collected from such experiments proved that the conversion of thyroxine does occur in the isolated liver and that it occurs at a rate comparable to that observed in the intact animal. This information serves to indicate (a) that the conversion of thyroxine can and probably does take place in the liver, and (b) that the isolated perfused rat liver resembles the normal organ with respect to this function as well as with respect to others which have been previously described. (auth)

6295

SOME ASPECTS OF TRACER THEORY. Daniel C. Tosteson. Record Med. Gen. Practice Clinics 165, 346-51(1952) June.

Mathematical treatment is given of two of the many situations in which tracers may be used, namely, (1) metabolic analysis of N^{15}-tagged uric acid injected intravenously in humans as illustrative of a simple one-compartment open system — steady state, and (2) the exchange of K^{42} between human red blood cells and plasma as illustrative of a slightly more complicated two-compartment closed system — steady state. Particular emphasis is placed on the number of experimental quantities necessary for solution of the equations.

6296

BACILLUS SUBTILIS SPORES LABELLED WITH RADIOPHOSPHORUS. G. J. Harper and J. D. Morton. J. Gen. Microbiol. 7, 98-106(1952) Aug.

Bacillus subtilis was grown in surface culture on media containing about 0.6 mc/ml of P^{32} as phosphate, and harvested after 2 days. The spore suspension was heated at 60° for 1½ hr and washed by centrifuging and resuspending in water six times. The fresh suspension contained about 2×10^9 spores/ml, of which 20% were viable. The radioactivity was about 0.05 mc/ml of which more than 95% was carried by the spores. The radioactivity was sufficient for 10^3 spores to be readily detected and assessed by conventional G-M counting methods. These highly radioactive suspensions are particularly useful in studying the respiratory retention of bacterial aerosols. (auth)

6297

THE EFFECT OF PARTICLE SIZE ON BLOOD CLEARANCE AND TISSUE DISTRIBUTION OF RADIOACTIVE GOLD COLLOIDS. D. B. Zilversmit, George A. Boyd, and Marshall Brucer. J. Lab. Clin. Med. 40, 255-60(1952) Aug.

It has been shown that relatively large colloidal gold particles were removed from the blood stream of dogs at a more rapid rate than the smaller ones. The liver and spleen took up 80 to 90 per cent of the injected gold independent of particle size within the range studied. (auth)

CHEMISTRY

6298

Brookhaven National Lab.

REMARKS OF R. CHRISTIAN ANDERSON OF BROOKHAVEN NATIONAL LABORATORY, UPTON, L. I., NEW YORK, AT THE CONCLUSION OF PROFESSOR SCOTT'S TALK ON "THE LIGHT METAL CARBONYLS," by R. Christian Anderson. [nd] 4p. (BNL-1257)

The mechanism of formation of alkali metal carbonyls from metal ions and CO is discussed. The mechanism of hydrolysis of the metal carbonyls with water is shown.

6299

Pennsylvania State Coll. School of Chemistry and Physics

STUDIES ON COORDINATION COMPOUNDS. VII. CHELATE COMPOUND STABILITY IN THE DISSOLVED STATE, by LeGrand G. Van Uitert, W. Conard Fernelius and Bodie E. Douglas. Mar. 5, 1952. 17p. (NYO-3372)

Chelate compound stability in solution is found to be a function of the covalent character of the bonds between the metal ion and the chelating atoms. The relationship that exists may be written as $\log K_f = f(x_m \cdot B_h)$, where $\log K_f$ is the logarithm of the chelate compound formation constant, X_m is the metal ion electronegativity, and B_h is the hydrid bond strength assigned for certain symmetrical distributions of coordinated particles about a central atom. Chelate compound formation constants of dibenzoylmethane and acetylacetone with a wide variety of metal ions have been determined in a water-dioxane mixture containing a dioxane mole fraction $n_2 = 0.380$.

6300

Pittsburgh Univ.

PROGRESS LETTER FROM APRIL 1, 1952 TO JUNE 30, 1952, by Robert Levine, Newton N. Goldberg, Mary L. Marquardt, Thomas F. McGrath and Carl Osuch. Issued July 22, 1952. 4p. (NYO-3379)

During this period work has continued in the synthesis of potential chelating agents and related compounds by metalating appropriate tar bases and acylating the organometallic compounds thus obtained. Attempts to acylate various picolines, quinolines, pyridines, and ketones are summarized. The reaction of trifluoroacetic acid with phenyl lithium is still under study, and a project to synthesize ketones by metalation of pyridine has been initiated.

6301

Catholic Univ. of America

COMPLETE SCIENTIFIC REPORT ON CONTRACT TERMINATION [ON] RATE PROCESSES IN INORGANIC SOLIDS AT HIGH TEMPERATURES [FOR] OCTOBER 1, 1950 TO AUGUST 1, 1951, by W. J. Moore. [nd] 25p. (ORO-78)

Processes are considered for which diffusion in the solid state is the rate-determining step. The results of diffusion coefficient measurements in oxide systems are reviewed in terms of defect concentrations and defect diffusivities. The important role of the dissociation constant for defects becomes apparent, and evidence is presented to show that in nickel oxide the cationic vacancies responsible for diffusion are only singly dissociated. A method is developed for tracer studies in nickel and its compounds that uses a mixture of Ni^{63} and Ni^{59}. The selfdiffusion coefficient of nickel is measured as $D = 0.041 \exp(-55 \text{ kcal/RT}) \text{ cm}^2 \text{ sec}^{-1}$. (auth)

6302

THE PREPARATION AND PARTICLE SIZE MEASUREMENT OF MONODISPERSE RADIOACTIVE GOLD COLLOIDS. D. B. Zilversmit, George A. Boyd, and Marshall Brucer. J. Lab. Clin. Med. 40, 261-6(1952) Aug.

A method is presented whereby monodisperse radioactive gold sols can be prepared and their particle size measured

by means of a low-speed centrifuge. The procedure is simple enough to be used routinely in the characterization of radioactive materials before their administration to patients or animals. (auth)

6303
A SEXAVALENT RUTHENIUM SULPHATE. F. S. Martin. J. Chem. Soc., 3055-9(1952) Aug.

The reduction of Ru tetroxide by various reducing agents in sulfuric acid has been studied. The primary reduction is thought to be from Ru(VIII) to Ru(IV) and it is shown that these two states disproportionate to form Ru(VI). Ru(VI) sulfate solutions decompose in a few hours at room temperature, probably by disproportionation to Ru(VIII) and Ru(IV). It is considered that the solution contains the complex $[RuO_2(SO_4)_2]^{--}$ rather than the ruthenyl ion RuO_2^{++}. (auth)

ANALYTICAL PROCEDURES

6304
Department of Mines and Technical Surveys (Canada)
THE DETERMINATION OF URANIUM AND THORIUM IN ORES, by G. G. Eichholz, J. W. Hilborn, and C. McMahon. Aug. 1, 1952. 26p. (NP-4105; TR-99/52)

The application of various physical methods to the assay of U and Th in ores is discussed. It is shown how it is possible to determine their U and Th content by means of simultaneous measurement of their β and γ activities. Simple working equations are derived which permit this determination to be carried out irrespective of the equilibrium condition of the sample. A suitable experimental setup is described briefly and some typical experimental results are presented. (auth)

6305
Geological Survey
NONINTERFERENCE OF ARSENATE ION IN THE VOLUMETRIC DETERMINATION OF URANIUM USING THE JONES REDUCTOR, by Jack J. Rowe. Oct. 1951. 9p. (TEM-316)

Arsenate ions in H_2SO_4 solution do not interfere in the volumetric determination of U when Zn amalgam reductors are used. Tests on Zn reductors amalgamated with 2%, 3%, and 10% by weight of Hg indicate that the arsenate ion is reduced slightly but this interference is overcome during the aeration of the solutions after passage through the reductors and prior to titration. (auth)

6306
DETERMINATION OF SMALL CONCENTRATIONS OF INDIUM BY RADIOACTIVATION. J. E. Hudgens and L. C. Nelson. Anal. Chem. 24, 1472-4(1952) Sept.

This work was undertaken to develop a radiochemical procedure for the determination of microgram or submicrogram quantities of In in materials that might be used in nuclear reactors. A method was developed in which neutron activation with a nuclear reactor and with a Ra-Be source was used to determine In concentrations of a few parts per million. The ultimate sensitivity of the method is 10^{-11} g when the thermal neutron flux of 4×10^{12} n/sec/cm^2 obtainable in a reactor is used. A rapid solvent extraction method for separating the In from other sample components was developed. The method is applicable to the determination of In in a wide variety of sample types. (auth)

6307
RAPID METHOD FOR DETERMINATION OF SMALL AMOUNTS OF ZIRCONIUM. Ralph E. Oesper, Raymond A. Dunleavy, and Joseph J. Klingenberg. Anal. Chem. 24, 1492-4(1952) Sept.

Various azo derivatives of mandelic acid were synthesized in a search for a reagent producing a colored Zr precipitate. Only m-azo-β-naphtholmandelic acid seemed worthy of further study. The similarity of the color of the reagent to its Zr precipitate and the solubility characteristics of the acid indicated that the most suitable use would be along the lines of the Yagoda confined spot testing method. Effects of solvent, time, temperature, acidity, cosolutes, etc., on the procedure were evaluated.

6308
INORGANIC CHROMATOGRAPHY ON CELLULOSE. PART XII. THE QUANTITATIVE DETERMINATION OF TANTALUM AND NIOBIUM IN COMPLEX MINERALS, ORES, AND SYNTHETIC MATERIALS. A. F. Williams. J. Chem. Soc., 3155-63(1952) Aug.

A new chromatographic method based on cellulose as adsorbent and ethyl methyl ketone containing HF as solvent, has been described for the quantitative separation of Ta from Nb and for their determination in certain types of mixtures. This method has been modified so that it is now applicable to the quantitative determination of these elements in complex materials containing appreciable amounts of Ti, Sn, and Zr. A solution of the sample in HF containing ammonium fluoride being used, Ta is extracted first in ethyl methyl ketone saturated with water. The column is then washed with ketone containing 1% (v/v) of HF (40% w/w aqueous solution) which arrests the movement of Ti, Sn, and Zr. Nb is then extracted with the ketone containing 12.5% of HF. After removal of solvent the Ta and Nb are determined in the appropriate fractions by ignition to the pentoxides. The procedure is simple and accurate and has been used for the analysis of a wide range of natural and synthetic materials. (auth)

6309
QUANTITATIVE SPECTROCHEMICAL ANALYSIS OF RARE EARTH MIXTURES. J. A. Norris and C. E. Pepper. Anal. Chem. 24, 1399-1403(1952) Sept.

A porous cup spectrochemical procedure for analysis of rare-earth mixtures has been developed to assist in the preparation of pure rare-earth compounds for use in the electromagnetic enrichment of the isotopes of these elements. Precision of this method, = 10% at a 99.5% confidence level, is such that small differences can be detected, thus permitting better evaluation of the chemical separation processes. Analyses of 10 samples for 5 rare earths can be completed in approximately 1 man-day. This procedure permits the quantitative determination of individual rare earths in complex rare-earth mixtures and is limited only to the elements available for preparation of standards. Use of the solution technique eliminates possible inhomogeneities in sampling. No difficulties with interelement effect, outside of direct line interference, have been noted. Data obtained give strong evidence of the importance of proper application of the spectroscopic principle of homologous lines in the selection of the internal standard element. (auth)

6310
PHOTOMETRIC DETERMINATION OF ZIRCONIUM IN MAGNESIUM ALLOYS. Glenn B. Wengert. Anal. Chem. 24, 1449-51(1952) Sept.

The development of a new system of Mg-base alloys containing small amounts of Zr led to the search for a faster and more accurate method for the determination of Zr. The photometric alizarin red S method has been developed and found to give accuracy equal to or better than the gravimetric procedures. This has been applied to the analysis of a variety of Mg alloys with Zr contents ranging from 0.10 to 1.00%. A significant saving of time has been accomplished. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6311
Naval Radiological Defense Lab.
F- AND U-CENTERS IN SOLID SOLUTIONS OF ALKALI

HALIDES, by R. A. Levy. Aug. 12, 1952. 13p. (USNRDL-357)

The stability of solid solutions of some alkali halides suggests that single crystals can be grown in such solutions, and F- and U-centers produced in the crystals so produced. Single crystals of KCl-KBr, NaCl-NaBr, and KBr-KI were grown in mixtures of several proportions. F-centers were produced and measured in all of these, with U-centers being observed in one, KCl-KBr. Semi-empirical expressions relating F- and U-band wave lengths are given, and are compared with equations given by Fröhlich and Ivey. A use of the mixed crystals as optical stop-band filters is suggested. (auth)

6312

CRYSTAL CHEMICAL STUDIES OF THE 5f-SERIES OF ELEMENTS. XVIII. CRYSTAL STRUCTURE STUDIES OF NEPTUNIUM METAL AT ELEVATED TEMPERATURES. W. H. Zachariasen. Acta Cryst. 5, 664-70(1952) Sept. 10.

The orthorhombic room-temperature form of Np metal (α-Np) is found to be stable up to 278°C. Unit-cell dimensions and thermal-expansion coefficients in the range 20 to 278°C are given. At 278 ± 5°C α-Np transforms into β-Np, which is tetragonal. The tetragonal modification is stable up to about 540C°. At 313°C the dimensions of the unit cell containing four atoms are $a_1 = 4.897 \pm 0.002$, $a_3 = 3.388 \pm 0.002$ A, and the calculated density at this temperature is $\rho = 19.36$ g/cm³. The atomic positions in the β-Np structure are: 2 Np(I) in (0, 0, 0), ($\frac{1}{2}$, $\frac{1}{2}$, 0); 2 Np(II) in ($\frac{1}{2}$, 0, u), (0, $\frac{1}{2}$, $\bar{u}$) with $u = 0.375 \pm 0.015$. As in α-Np, each atom forms four short bonds. There is strong indication of a transition point at about 550°C. Above this point the metal seems to be b.c.c (γ-Np) with a = 3.52 A, and this phase is presumably stable up to the melting point at 640°C. The structural relationships between the three forms of Np metal are discussed. (auth)

6313

LAUE ASTERISM AND DEFORMATION BANDS. E. A. Calnan. Acta Cryst. 5, 557-65(1952) Sept. 10.

From x-ray and optical observations on Al single crystals in tensile deformation it is shown that the asterism in the usual type of Laue patterns is associated with macroscopic misorientations of the crystal. The changes of orientation may be ascribed to two distinct types of deformation bands, the kink bands previously reported by Cahn and others, and lamellar regions where the primary slip system is less marked and additional systems operate. The nature of these latter bands is discussed in relation to current ideas on inhomogeneous deformation. (auth)

6314

A NEUTRON-DIFFRACTION STUDY OF MAGNESIUM ALUMINIUM OXIDE. G. E. Bacon. Acta Cryst. 5, 684-6 (1952) Sept. 10.

The neutron-diffraction pattern of spinel, $MgAl_2O_4$, demonstrates that the cationic arrangement corresponds closely with the so-called "normal" structure, the scattering amplitudes of Mg and Al being sufficiently different to distinguish this from the "inverse" structure. The oxygen parameter u is 0.387. (auth)

6315

CRYSTAL CHEMICAL STUDIES OF THE 5f-SERIES OF ELEMENTS. XVII. THE CRYSTAL STRUCTURE OF NEPTUNIUM METAL. W. H. Zachariasen. Acta Cryst. 5, 660-4(1952) Sept. 10.

On the basis of powder diffraction patterns Np metal is found to be orthorhombic. The unit cell containing eight atoms has dimensions $a_1 = 4.723 \pm 0.001$, $a_2 = 4.887 \pm 0.002$, $a_3 = 6.663 \pm 0.003$ A. The calculated density is $\rho = 20.45 \pm 0.03$ g/cm³. The space group is Pmcn, and the atomic positions are: 4 atoms in $\pm(\frac{1}{4}, y_1 z_1)$ $(\frac{1}{4}, \frac{1}{2} - y_1, z_1 + \frac{1}{2})$ with $y_1 = 0.208 \pm 0.006$, $z_1 = 0.036 \pm 0.006$; and 4 atoms in $\pm(\frac{1}{4}, y_2, z_2)$ $(\frac{1}{4}, \frac{1}{2} - y_2, z_2 + \frac{1}{2})$ with $y_2 = 0.842 \pm 0.006$, $z_2 = 0.319 \pm 0.006$. The structure can be regarded as a heavily deformed b.c.c. structure. The deformation is such that the coordination number is reduced from eight to four, the bond length being 2.60 to 2.64 A. The four short bonds are of covalent type and have a strength about halfway between a single and a double bond. It is concluded that there is at most one 5f-electron per atom in Np metal. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

6316

INFRARED SPECTRUM OF DEUTERATED ASCORBIC ACID. NOTE ON LABILE HYDROGENS. John W. Weigl. Anal. Chem. 24, 1483-6(1952) Sept.

Comparison of the spectra of normal ascorbic acid, deuterated ascorbic acid, and two derivatives, in which two and four hydroxyls, respectively, had been removed, permitted the identification of a considerable number of their absorption bands. The spectra revealed that in ascorbic acid at least one of the hydrogens attached to carbon is readily exchangeable, although these are often considered to be nonlabile. These observations demonstrate the power of the combined use of the mass spectrometer and the infrared spectrometer in analysis for deuterium in organic compounds. The former provides a quantitative measure of the over-all tracer content, while the latter shows the distribution of isotopes among the various hydrogen positions in the molecule.

6317

TWO D_2O MICROWAVE ABSORPTION LINES. C. I. Beard and D. R. Bianco. J. Chem. Phys. 20, 1488-9(1952) Sept.

Two absorption lines in the microwave region have been observed in D_2O vapor, and their Stark spectra have been studied. The frequencies, 10,919.8 ± 0.1 and 10,947.4 ± 0.1 Mc, have been assigned to the transitions $2_{2,0;2} \rightarrow 3_{1,3;-2}$ and $5_{3,2;1} \rightarrow 4_{4,1;3}$, respectively, of the D_2O molecule. The Stark-effect calculations show the $5_{3,2;1}$ energy level to be above the $4_{4,1;3}$ level in D_2O.

FLUORINE AND FLUORINE COMPOUNDS

6318

PATHOLOGICAL FINDINGS IN FLUORINE INTOXICATION. Leo Spira. Exptl. Med. Surg. 10, 54-62(1952).

Fluorine is a substance capable of producing damage in various parts of the body. Apart from gastro-duodenal lesions which occur in experimental animals and in fatal cases of acute intoxication in man, the kidneys are the most frequently affected organ. In experimental chronic F poisoning, changes in the thyroids may often be co-existent, but those of the parathyroids, hypophysis, and testes require further investigation. Advanced lesions found in the kidneys and thyroids of experimental rats are recorded. (auth)

6319

FURTHER STUDY OF THE RÔLE PLAYED BY FLUORINE IN THE CAUSATION OF DISEASE. Leo Spira. Exptl. Med. Surg. 10, 63-8(1952).

Treatment directed against chronic F poisoning in one patient suffering from gastro-duodenal ulceration, and in another suffering from nephritis led to a remarkably prompt amelioration of the conditions. The influence of F compounds on the thyroid gland is discussed. (auth)

6320

THERMODYNAMIC PROPERTIES OF CHLORINE TRIFLUORIDE. Alfons Weber and Salvador M. Ferigle. J. Chem. Phys. 20, 1497(1952) Sept.

The problem of the ClF_3 structure is discussed. If the

planar C_2 structure is assumed, a reasonable assignment of the fundamental frequencies in terms of these data might be the following: C–F stretchings, 508, 644, and 750 cm^{-1}; planar bendings, 316 and 428 cm^{-1}; and out-of-plane bending, 395 cm^{-1}. From these frequencies and the data of Smith (Phys. Rev. 86, 608(1952)), the entropy for the ideal gas at 1 atm pressure and at a temperature of 284.91°K is calculated as 66.64 cal/mole/deg.

GRAPHITE

6321

North American Aviation, Inc.

DYNAMIC CORROSION OF GRAPHITE BY LIQUID BISMUTH, by W. J. Hallett and T. A. Coultas. Issued Sept. 22, 1952. 21p. (NAA-SR-188)

No corrosion or mass transfer of graphite by bismuth was observed when the liquid metal was circulated by means of thermal convection in an all-graphite system. A calculated linear velocity of approximately 7 in./sec was maintained for a period of 279 hr at a maximum temp. of 1400°C and a minimum temp. of 875°C. No metallographic evidence of solution of graphite in bismuth was found and measurement of the inside diameter of the tubes before and after operation showed no change of dimension. No indication of penetration of the graphite by bismuth was found. (auth)

6322

General Electric Research Lab.

ON THE PROPERTIES OF GRAPHITE, by John P. Howe. Apr. 1952. 24p. (RL-685)

The structure, thermal properties, electrical characteristics, and mechanical behavior of graphite are reviewed and the highly anisotropic character of graphite crystals emphasized. The interesting properties of graphite are due in large measure to the strong semimetallic bonds between carbon atoms in plane layers and to the relatively weak binding between planes. Details of its structure are due in part to the Frank dislocation mechanism for growth of crystals. Thus graphite has a low vapor pressure, and approximately two-dimensional electrical and thermal conductivity. It is easily deformed in slip on the basal plane, but in polycrystalline form is relatively strong at high temperature. Its lamellar nature is emphasized by its reaction with alkali metals and bromine. (auth)

LABORATORIES AND EQUIPMENT

6323

Isotopes Div., Advisory Field Service Branch, AEC

DESIGN OF LABORATORIES FOR SAFE USE OF RADIOISOTOPES, by Donald R. Ward. [nd] 40p. (AECU-2226)

Special laboratory facilities recommended for radioisotope work are described. The laboratory design problems are specifically applicable to handling microwave and millicurie amounts of most common radioisotopes. Facilities, equipment, and cost estimates are listed.

6324

[New York State Coll. of Ceramics], Alfred Univ.

A HYDRAULICALLY OPERATED LABORATORY FURNACE WITH RESISTANCE THERMOMETER TEMPERATURE CONTROL; TECHNICAL REPORT, by H. I. Sephton. June 15, 1952. 9p. (NP-4008; U-23463)

A high-temperature, rapid-loading furnace was constructed for study of small specimens in a controlled atmosphere. The furnace muffle consists of a vertical 36-in.-long Zircotube, 1.5 in. in diameter; the tube is necked down at the upper end to fit the tubing for gas supply. This muffle is surrounded by 8 Globar heating elements placed in a circle inside an 8-in. fire-clay muffle which is surrounded by light MgO. These components are contained in a metal drum 21.5 in. high and 18 in. in diameter. The furnace also has a hydraulic lifting device and an automatic temperature controller. Introduction of a sample at elevated temperature does not affect the temperature of the furnace. The apparatus is easily and rapidly manipulated by one man. (NRS abst.)

RADIATION CHEMISTRY

6325

THEORETICAL VIEW ON "HOT ATOM CHEMISTRY." P. C. Capron and Y. Oshima. J. Chem. Phys. 20, 1403-10 (1952) Sept.

Considering only collisions of the "billiard ball" type the total retention is obtained as a sum of partial retentions for an infinite number of collisions. Expressions are derived which give the retention as a function of the initial energy of the recoil atom. The calculation shows that it is not possible to determine the initial recoil energy by the retention. (auth)

RADIATION EFFECTS

6326

THE ACTION OF IONISING RADIATIONS AND OF RADIOMIMETIC SUBSTANCES ON DEOXYRIBONUCLEIC ACID. PART VI. PHYSICOCHEMICAL MEASUREMENTS OF THE ACTION OF BISCHLOROETHYLMETHYLAMINE. J. A. V. Butler, L. Gilbert, and D. W. F. James. J. Chem. Soc., 3268-73(1952) Aug.

The mobilities and sedimentation and diffusion constants of desoxyribonucleic acid, which has been treated with bischloroethylmethylamine, have been determined after various periods of reaction. The molecular size decreases for a considerable time after the initial reaction. The initial change of viscosity appears to be independent of this, at least at pH 7, and is ascribed to changes of interaction and configuration consequent on the breakage of hydrogen bonds owing to the alkylation of the primary amino groups of the bases. (auth)

6327

CHEMICAL ACTIONS OF IONISING RADIATIONS IN SOLUTIONS. PART X. THE ACTION OF X-RAYS ON AMMONIA IN AQUEOUS SOLUTION. Tyson Rigg, George Scholes, and Joseph Weiss. J. Chem. Soc., 3034-8(1952) Aug.

It has been found that NH_3 in dilute aqueous solutions is oxidized to nitrite at room temperature by the action of the radicals produced by irradiation with x rays, provided that molecular oxygen is present. The influence of pH, concentration, and other factors on this process has been investigated. Hydroxylamine is apparently not involved as an intermediate. Attention has been drawn to the related biological process. (auth)

6328

THE FORMATION OF HYDROGEN PEROXIDE BY α-RADIATION IN THE PRESENCE OF THE ENZYME CARBOXYPEPTIDASE. W. M. Dale, J. V. Davies, C. W. Gilbert, J. P. Keene, and L. H. Gray. Biochem. J. 51, 268-70(1952) May.

The yield of hydrogen peroxide produced by the action of α rays from radon on water and on a 0.1% solution of the enzyme carboxypeptidase have been compared and no significant difference found. This result confirms the view suggested in an earlier publication that the production of hydrogen peroxide by α radiation takes place in the core of the track and that the small amount of inactivation of carboxypeptidase by α radiation is due to the δ rays which branch off as spurs from the α track. (auth)

6329

THE INACTIVATION OF UREASE BY DEUTERONS AND HEAT. R. B. Setlow. Arch. Biochem. Biophys. 36, 328-35(1951).

The inactivation of urease by dry heat indicates that the molecule is not unfolded in the activated state. The inactivation of urease by deuterons shows that the molecular weight of urease is probably in the neighborhood of 100,000, as compared with the previously accepted 480,000. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

6330

Radiation Lab., Univ. of Calif., Berkeley

THE VAPOR PHASE HYDROLYSIS OF THE RARE EARTH HALIDES. II. HEAT AND FREE ENERGY OF THE REACTIONS: $SmCl_{3(s)} + H_2O_{(g)} = SmOCl_{(s)} + 2HCl_{(g)}$ AND $GdCl_{3(s)} + H_2O_{(g)} = GdOCl_{(s)} + 2HCl_{(g)}$, by C. W. Koch and B. B. Cunningham. Aug. 13, 1952. 9p. (UCRL-1918)

With the experimental method of C. W. Koch et al. (J. Am. Chem. Soc. 74, 2349(1952)), measurements of equilibrium constants for the reactions

$$SmCl_{3(s)} + H_2O_{(g)} = SmOCl_{(s)} + 2HCl_{(g)} \text{ and}$$

$$GdCl_{3(s)} + H_2O_{(g)} = GdOCl_{(s)} + 2HCl_{(g)}$$

at various temperatures gave the free energy functions

$$\Delta F^0_{(kcal)} = 21.56 + \frac{6.4\ T \log T}{1000} + 1.8 \times 10^{-7}\ T^2 - \frac{22}{T} - \frac{53.01\ T}{1000},$$

and

$$\Delta F^0_{(kcal)} = 19.96 + \frac{6.4\ T \log T}{1000} + 1.8 \times 10^{-7}\ T^2 - \frac{22}{T} - \frac{51.88\ T}{1000},$$

respectively. An estimated ΔCp function of $-2.8 - 0.36 \times 10^{-3}\ T + 0.44 \times 10^5\ T^{-2}$ was used for both reactions. Within the experimental temperature range of about 700 to 900°K these functions are consistent with the experimental measurements within an average deviation of about ±0.07 kcal. Because of the possible error in the estimated ΔCp function, however, extrapolation to 298°K involves a much larger uncertainty. (auth)

6331

FERROMAGNETISM OF CERTAIN GADOLINIUM–MAGNESIUM ALLOYS. Françoise Gaume-Mahn. Compt. rend. 235, 352-4(1952) Aug. 4. (In French)

Magnetic susceptibilities of Gd-rich (>72% Gd) Gd–Mg alloys were measured between 78 and 300°K. The compound GdMg, which has a characteristic Curie temperature of 102 ± 3°K, is shown to exist.

6332

RARE EARTH ELEMENTS. E. A. Terent'eva. Priroda, 71-81(1952) Apr. (In Russian)

The history of the lanthanide elements is recounted, and their general chemical, physical, and biological properties are discussed. The 15 references are all to Russian literature.

SEPARATION PROCEDURES

6333

Oklahoma Agricultural and Mechanical Coll.

SOME FACTORS INFLUENCING LIQUID-LIQUID EXTRACTION AND SEPARATION OF SALTS. Aug. 14, 1952. 39p. (AECU-2246)

The determination of the causes for the differences in extraction of salts having chemically similar cations is discussed, and determination of the variables affecting the change in distribution of a particular salt in a given solvent pair is described.

6334

SEPARATION OF PRASEODYMIUM FROM LANTHANUM BY FRACTIONAL CARBONATE PRECIPITATION IN TRICHLOROACETATE SOLUTION. Laurence L. Quill and Murrell L. Salutsky. Anal. Chem. 24, 1453-5(1952) Sept.

Precipitation from homogeneous solution appeared to be a potentially rapid means of separating mixtures of the rare-earth elements. The separation and purification of Pr from La-Pr mixtures were effected by the homogeneous precipitation of rare-earth carbonates in trichloroacetate solution. Pr concentrated in the carbonate precipitates, which upon repeated fractionation yielded a final product of spectroscopic purity. The Pr enrichment was independent of the temperature at which the precipitation was made, but seemed to be somewhat greater in dilute solutions. The procedure was applied to the fractionation of a crude yttrium group concentrate with good results. The trichloroacetate method is simpler and more rapid than most fractional methods for separating rare earths. (auth)

6335

INVESTIGATION OF THE PROCESS OF RECTIFICATION OF BINARY MIXTURES IN A VERTICAL ROTATING APPARATUS. N. I. Gel'perin and M. S. Khatsenko. Zhur. Priklad. Khim. 25, 610-15(1952) June. (In Russian)

SORPTION PHENOMENA

6336

EFFECT OF PRESSURE ON SOLUBILITY OF MOLECULAR HYDROGEN IN THE β PHASE OF PALLADIUM-HYDROGEN SYSTEMS. P. S. Perminov, A. A. Orlov, and A. N. Frumkin. Doklady Akad. Nauk S.S.S.R. 84, 749-52 (1952) June 1. (In Russian)

6337

ADSORPTION AND SOLUTION OF HYDROGEN BY DISPERSED PALLADIUM – RHODIUM ALLOYS. I. P. Tverdovskiĭ and A. I. Stetsenko. Doklady Akad. Nauk S.S.S.R. 84, 997-1000(1952) June 11. (In Russian)

Adsorption of H_2 by electrolytically dispersed Rh or Rh – Pd alloys of various compositions in 1N KOH, H_2SO_4, and HBr solutions is plotted.

SPECTROSCOPY

6338

Iowa State Coll.

SOLUTIONS OF HALOGENS IN HIGHLY ACIDIC, POLAR SOLVENTS, by Robert E. Buckles and Jack F. Mills. [nd] 16p. (AECU-2223)

A study of the absorption spectra of iodine, iodine chloride, and bromine in various solvents showed that in the highly acidic, polar solvents, trifluoroacetic acid and sulfuric acid, the halogens behaved spectrophotometrically very much as they did in relatively nonpolar solvents, e.g., carbon tetrachloride of ethylene chloride, where little if any complexing is expected to take place. On the other hand a comparison of the halogens in these very acidic solvents with solutions in anhydrous acetic acid, a typical complexing solvent for halogens, showed much wider spectrophotometric differences. Estimation of equilibrium constants for the complexing of iodine and iodine chloride with acetic acid and with trifluoroacetic acid also showed that the latter highly acidic solvent has considerably less tendency to complex than does the former less acidic solvent. (auth)

SYNTHESES

6339

National Inst. of Arthritis and Metabolic Diseases, National Institutes of Health

OXIDATION OF MICROGRAM QUANTITIES OF HISTAMINE TO IMIDAZOLEACETIC ACID DEMONSTRATED BY ISOTOPE TRAPPING IN VIVO, by Herbert Tabor and Alan H. Mehler. National Inst. of Arthritis and Metabolic Diseases, National Institutes of Health and Richard W. Schayer, Rheumatic Fever Research Inst., Northwestern Univ. Medical School. [nd] 8p. (AECU-2227)

Previous studies had shown imidazoleacetic acid to be excreted when large doses of histamine were administered to rats, but not when small doses were used. In this paper, isotope trapping experiments have been reported, in which microgram quantities of C^{14}-histamine were given to rats. At least 40% of the isotope was accounted for as imidazoleacetic acid. These results indicate that imidazoleacetic acid is an intermediate in a major pathway of histamine metabolism. (auth)

6340
Radiation Lab., Univ. of Calif., Berkeley
SYNTHESIS OF LABELED ORGANIC COMPOUNDS, by B. M. Tolbert and David Kritchevsky. Issued July 1952. 133p. (UCRL-1866)

A review of the techniques and procedures associated with the use of tracer elements in organic chemistry is presented. Techniques for the manipulation and the synthesis into organic compounds of the isotopes of C, H, N, O, S, and the halogens are outlined. (auth)

6341
BIOSYNTHESIS OF GLUTAMINE, CARBOHYDRATES, AND ALBUMIN LABELED WITH RADIOACTIVE CARBON. A. M. Kuzin and V. I. Merenova. Doklady Akad. Nauk S.S.S.R. 85, 181-3(1952) July 1. (In Russian)

An apparatus and technique for obtaining C^{14}-labeled photosynthetic products of sugar beets are described.

6342
RADIOACTIVE TOBACCO MOSAIC VIRUS. H. Schönfellinger and E. Broda. Monatsh. 83, 837-9(1952) June 15. (In German)

C^{14}-labeled tobacco mosaic virus was prepared by growing infected Nicotiana tabacum plants in a $C^{14}O_2$ atmosphere.

TRACER APPLICATIONS

6343
Rheumatic Fever Research Inst., Northwestern Univ. Medical School
EFFECT OF ADRENALECTOMY ON THE RATE OF METABOLISM OF HISTAMINE IN THE MOUSE, by Richard W. Schayer, Rosa L. Smiley and Jean Kennedy. [nd] 7p. (AECU-2229)

No significant difference was found between adrenalectomized and sham-operated mice in the ability to destroy minute quantities of injected C^{14}-histamine. (auth)

6344
A METHOD FOR THE BIOLOGICAL PREPARATION OF DEUTERIUM-LABELED CHOLESTEROL FROM THE HEN'S EGG. Leslie I. Rice, Roslyn B. Alfin-Slater, and Harry J. Deuel, Jr. Proc. Soc. Exptl. Biol. Med. 80, 562-3(1952) July.

A simple, relatively inexpensive method for the biological preparation of deuterium-labeled cholesterol from hen's eggs is described. Laying hens were given an isotonic solution of sodium-acetate, labeled with deuterium in the methyl position, dissolved in 2.5% deuterium oxide in their drinking water. The daily incorporation and subsequent disappearance of the deuterium into the egg cholesterol has been followed.

URANIUM AND URANIUM COMPOUNDS

6345
A NEW METHOD FOR THE COLORIMETRIC ESTIMATION OF URANIUM WITH RESACETOPHENONE-OXIME. M. Kantharaj Urs and K. Neelakantam. J. Sci. Ind. Research (India) 11B, 79-80(1952) Feb.

During a systematic investigation of the color reactions of uranyl ions with aromatic o-hydroxy-carbonyl compounds and their derivatives, 2,4-dihydroxyacetophenone oxime was found to be a more sensitive reagent than gallic or salicylic acids. A linear relation between U concentration and optical density was established by means of a photoelectric colorimeter.

ENGINEERING

6346
Technical Information Service, AEC
NUCLEAR SCIENCE IN ENGINEERING EDUCATION; A SELECTED LIST OF REFERENCES FOR INSTRUCTORS; FIRST REVISION. Simone B. Schwind, comp. Sept. 1952. 17p. (TID-3011(1st Rev.))

This revised version of TID-3011 contains 212 pertinent entries selected from the first version and from material of interest to engineers which has appeared recently. The bibliography covers reports of the AEC and its contractors, the journal literature, textbooks, and reference books.

HEAT TRANSFER AND FLUID FLOW

6347
HYDRAULIC THEORY ON CONVEYING A MIXTURE OF SOLID PARTICLES WITH WATER UNDER PRESSURE. V. V. Kotul'skiĭ. Gidrotekh. Stroit., No. 8, 17-20(1951) Aug. (In Russian)

A theoretical substantiation is attempted for solution of three basic problems in hydraulic conveying: determination of resistance to motion of pulp in pipes, determination of efficient rates of pulp motion, and establishment of minimum permissible velocities at which solid particles do not precipitate from pulp.

6348
HELICAL MOTION IN PIPES. M. P. Kalinushkin. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk., 359-66(1952) Mar. (In Russian)

Experiments on the relation of the pitch of helical motion of liquids in pipes to the rate of flow are reported, and a criterion for this type of motion is derived.

6349
ON CERTAIN BOUNDARY VALUE PROBLEMS FOR EQUATIONS OF TURBULENT HEAT TRANSFER. G. I. Barenblatt and B. M. Levitan. Izvest. Akad. Nauk S.S.S.R. Ser. Mat. 16, 253-80(1952) May-June. (In Russian)

Eigenfunctions of the equation $y'' + \mu^{m+2} q(x)y = 0$, where $q(x)$ satisfies certain boundary conditions, are applied to solution of the equations of heat transfer or diffusion in turbulent flow.

MATERIALS TESTING

6350
Aeronautical Research Council (Great Britain)
SOME EXPERIMENTS ON THE RESISTANCE OF METALS TO FATIGUE UNDER COMBINED STRESSES; PART I AND PART II, by H. J. Gough, H. V. Pollard and W. J. Clenshaw. 154p. (NP-4078; Reports and Memoranda No. 2522; ATI-145915)

An experimental study is reported on the fatigue resistance of metals to combined flexural and torsional stresses. A selection of engineering and aircraft steels and two alloy cast irons were chosen for the tests. Four independent variables, reversed bending stresses, reversed torsional stresses, static bending stresses, and static torsional stresses superimposed on these cyclic stresses, were employed. A high-speed testing machine and a combined stress-fatigue testing machine designed especially for this study are described. Supplementary static, impact, and simple fatigue tests and results of chemical analysis and metallurgical examinations made on all test materials are summarized.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

6351

North American Aviation, Inc.

CORROSION OF REFRACTORIES BY TIN AND BISMUTH, by T. A. Coultas. Issued Sept. 15, 1952. 23p. (NAA-SR-192)

Static corrosion tests were made on several refractory materials in tin and bismuth at 1800°F. The materials tested in tin, listed in decreasing order of resistance to attack, were: graphite, Al_2O_3, Vycor, W, $MoSi_2$, TaC, Kennametal K-138A, Haynes Metamic LT-1, Ta, and Mo. The materials tested in bismuth, with those most resistant to attack listed first, were: graphite, Al_2O_3, ZrO_2, ThO_2, Mullite, Vycor, TaC, MgO, $MoSi_2$, Re, W, Mo, K-138A, SiC, Ta, Metamic LT-1, Ir, and AISI type 303 stainless steel with Mo coating. In addition, some tests were made at higher (2600° to 3600°F) temperatures. Results were appraised by both visual and metallographic examinations and by chemical analysis of the residual liquid metals. A small, simple method of testing materials in circulating liquids to obtain evidence of mass transfer is described. (auth)

6352

New Jersey Ceramic Research Station, Rutgers Univ.

REPORT NO. 33 [FOR] MARCH 1, 1952–MAY 31, 1952 on CERAMIC-METAL BODIES FOR USE AS AIRCRAFT POWER PLANT PARTS SUBJECTED TO ELEVATED TEMPERATURES to FLIGHT RESEARCH LABORATORY. [nd] 10p. (NP-4020)

TiN cermets were made using Ni-Cr and Co-Cr mixtures as the metallic component. Data were obtained on room temperature strength, apparent porosity, oxidation resistance, and strength after oxidation. Spectrographic analyses were made to check on the Fe and WC pickup during grinding.

6353

OXIDATION PRODUCTS WHICH CONTRIBUTE TO THE OXIDATION RESISTANCE OF TiC-BASE CERMETS. Harold M. Greenhouse. J. Am. Ceram. Soc. 35, 271-4 (1952) Oct.

The oxidation of TiC-base cermets can be minimized if two processes are stopped: (1) diffusion of oxygen into the cermet body and (2) diffusion of cermet components through the oxide to the oxide-air interface. Two methods of curtailing these diffusion processes are considered: (1) the formation of an amorphous glassy oxide and (2) the formation of oxidation products which enable certain types of crystalline oxides to occur in a definite order. Both these methods are discussed by means of representative examples. The cermet TiC-TiB_2-CoSi represents the first method; the cermet (Ti, Ta, Nb)C + Co represents the second method. (auth)

CORROSION

6354

TREATING SURFACES OF ALUMINUM AND ALUMINUM ALLOYS. Palma Szeki. Aluminium (Budapest) 3, 246-51(1951) Nov.

A new method is described for protecting Al and Al alloys under excessively corrosive conditions. It consists of simultaneous phosphatization and electrolytic Zn plating. Resistance to wear is increased by coating with Cr or by anode treatment. The latter is more economical, but is not yet considered practical.

GEOLOGY AND MINERALOGY

6355

Geological Survey

GEOPHYSICAL OBSERVATIONS IN PARTS OF THE GRANTS DISTRICT, McKINLEY COUNTY, NEW MEXICO, by Kenneth L. Cook and Calvin K. Moss. Aug. 1952. 13p. (TEI-244 (pt.I))

Geophysical observations were made near Haystack Mesa in the Grants district, McKinley County, N. Mex., with the dual objective of investigating the unusual occurrence of negative aeromagnetic anomalies in close association with airborne radioactivity anomalies, and of investigating other geophysical methods that might assist directly or indirectly in the search for U ores in the Grants district. Ground magnetometer tests indicated that the apparent correlation shown in the airborne data is fortuitous. Ground magnetometer and self-potential surveys on an experimental basis may be justified to test the applicability of these methods in future exploration. Aeromagnetic surveys would aid geologic field studies in locating concealed Tertiary intrusives, which may have affected ore localization. Continuation of the airborne radiometric survey of the outcrop of the Todilto limestone member of the Wanakah formation is recommended to search for promising areas that might contain additional uranium deposits. (auth)

6356

Geological Survey

RADIOACTIVE TERTIARY PORPHYRIES IN THE CENTRAL CITY DISTRICT, COLORADO, AND THEIR BEARING UPON PITCHBLENDE DEPOSITION, by George Phair. Aug. 1952. 53p. (TEI-247)

Results of analyses of 117 samples indicated that the porphyry sequence of Tertiary age in the middle part of the Front Range ranks as one of the most radioactive igneous series in the world, according to the present literature. With the intrusion of nonporphyritic, lime-poor, quartz bostonite dikes in the western half of the Central City district, the magmatic enrichment in both U and Th reached a peak of more than twentyfold over the best available averages for granitic rocks. The sequence of events in the Central City district is thought to be as follows: (1) intrusion of slightly to moderately radioactive monzonite throughout the eastern half of the district; (2) intrusion of excessively radioactive, nonporphyritic varieties of quartz bostonite in the western half of the district, north of what was to become the area of pitchblende deposition; (3) intrusion of the highly radioactive quartz bostonite porphyry dikes which are associated with 15 of the 17 known occurrences of pitchblende (all 15 are found within 500 ft of the dikes); (4) deposition of pitchblende as a local and unusual variant in the regional pyritic-gold ore deposition, near but not in, the quartz bostonite porphyry dikes. The implication of the field and chemical evidence is that U-rich solutions given off by a cooling quartz bostonite mass at depth, became further enriched by leaching U from the quartz bostonite channelways while en route to higher levels. Zircon, the probable host for much of the U and part of the Th in the rocks, separated in reduced amounts from the youngest quartz bostonite liquids—a change that, in effect, tended to throw U into the residual liquid. Possible mechanisms by which U became concentrated with respect to Th in the derived aqueous solutions are considered. In this connection the late magmatic introduction of the fluorite and of ferric oxides may be of special significance. (auth)

6357

THE USE OF LEAD ISOTOPE RATIOS IN ESTIMATING THE AGE OF THE EARTH. Edward McCrady. Trans. Am. Geophys. Union 33, 156-70(1952) Apr.

A method is proposed for determining the age of granites in years measured backward from now instead of from the assumed age of any given rock body; and suggestions are made as to how the same data may provide a basis for determining the age of the original crust of the Earth. A least-squares analysis of the data from isotope ratios in lead ores is used to show that the maximal possible age of matter is 5.07×10^9 years. Reasons are given for thinking

the real age less than that. The fact that least-squares equations, assuming alpha decay as the sole source of changes in the isotope ratios of uranium and lead in the past, can be extrapolated to the present ratio of U^{235}/U^{238} with a Lagrange multiplier not significantly different from zero, is interpreted to mean that other processes than alpha decay (such as natural fission, isotopic selectivity in crystal formation, and radon loss) have played no significant role in changing the composition of the ores.

6358
DISTRIBUTION OF RADIOACTIVITY AT DIFFERENT LEVELS OF KOLAR GOLD-FIELD MINES. C. Mahadevan and U. Aswathanarayana. J. Sci. Ind. Research (India) 11B, 202-3(1952) May.

Representative specimens of rock types collected from various depths and at regular intervals at Kolar Goldfields were examined for β activity. It was observed that (1) β activity of schists and dykes increases with depth; (2) the β activity curve of quartz veins is irregular, the histogram showing maxima when the quartz veins are feebly radioactive; (3) the mica pegmatites show the highest radioactivity; and (4) the β activity of pegmatites is variable but has no relation to depth.

6359
AGE FROM METAMICT MINERALS. J. Laurence Kulp, Herbert L. Volchok, and H. D. Holland. Am. Mineral. 37, 709-18(1952) Sept.-Oct.

Various specimens of metamict zircon, samarskite, microlite, fergusonite, pyrochlore, and ellsworthite have been subjected to α-activity measurement, differential thermal analysis and x-ray-diffraction analysis. The ratio of the area under the thermal curve peak, (which is proportional to the lattice disorganization), to the α activity increases with the age of the mineral. Furthermore in the case of 11 specimens of samarskite of the same geologic age from the Spruce Pine, N. C., district it was found that the differential thermal analysis peak area increases with α activity over a considerable range. It appears that a new method of age determination is available although much detailed study will be required before accurate geologic dates can be derived.(auth)

6360
ROLE OF POTASSIUM IN THE RADIOACTIVITY OF THE EARTH ACCORDING TO RECENT DATA. S. I. Danilevich. Izvest. Akad. Nauk S.S.S.R. Ser. Geofiz., No. 1, 3-11(1952) Jan.-Feb. (In Russian)

Relative proportions in the Earth of U, Th, and K^{40} at the present time and at 2, 3, and 4 billion years ago are calculated, the data on decay rates being critically evaluated. 46 references.

6361
EFFECT OF RADIOACTIVE DECAY ON THE THERMAL REGIME OF THE EARTH. E. A. Lyubimova. Izvest. Akad. Nauk S.S.S.R. Ser. Geofiz., No. 2, 3-14(1952) Mar.-Apr. (In Russian)

The Earth's internal temperature distribution due to the decay of U^{235}, U^{238}, Th, and K^{40} is calculated on the basis of certain assumptions as to structure and thermal conductivity.

METALS AND METALLURGY

6362
Brookhaven National Lab.
ENTROPIES OF ACTIVATION IN METALLIC DIFFUSION, by G. J. Dienes. [nd] 13p. (BNL-1249)

The various contributions to the entropy of activation for metallic diffusion are examined theoretically. In particular the entropy contribution arising from the altered vibrational frequencies around the saddle point is estimated. It is concluded that negative over-all entropies of activation are theoretically permissible and are likely to arise when the over-all activation energy is small. (auth)

6363
Massachusetts Inst. of Tech.
X-RAY STUDY OF COLD WORK IN THORIATED TUNGSTEN, by M. McKeehan and B. E. Warren. July 22, 1952. 15p. (NYO-769)

Spectrometer measurements were made of the x-ray diffraction peaks for cold-worked filings of thoriated tungsten; 99.25 tungsten, 0.75 thoria. A fourier analysis was made of the peak shapes, and the instrumental broadening corrected by using the peaks of annealed material. By separating the partical size and the distortion effects, it was found that the particle-size broadening corresponded to a size $\overline{L} = 200$ A. This value is to be interpreted as the size of the coherently diffracting domains, and is a measure of the distance between layers of slip planes or layers of dislocations. The coherent-distortion broadening indicated that strains in this material vary appreciably over distances of 25 A or less. Strain distribution curves were obtained from a fourier transform of the experimental coefficients. There is an indication that strains are smaller in the larger coherent regions. The measured root-mean-square strain corresponds to an elastic energy of 0.18 cal/g. Within experimental accuracy the integrated intensities are the same for the cold-worked or the annealed samples. (auth)

6364
Horizons, Inc.
TECHNICAL PROGRESS REPORT [ON] THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS [FOR] FIFTH QUARTER [COVERING PERIOD] JUNE 1 TO AUGUST 31, 1952, by Merle E. Sibert, F. Clifton Wagner and Morris A. Steinberg. Sept. 8, 1952. 32p. (NYO-3119)

Improvement of electrolytic cells for the production of Zr such that a consistently good product may be obtained repetitively on a given cell is described. Progress is reported on a process for semi-continuous production. This was done both by remelting used baths and through use of a cathode cooling chamber enabling several runs to be obtained in a given day with the same time allotment as a normal single run plus the cooling cycle. Conditions of maximum production were established with respect to K_2ZrF_6 concentration. Evaluations of analytical production, screen analysis, hardness testing, and metallurgical properties are also included.

6365
ON THE EFFECT OF COMPOSITION OF ALUMINUM ALLOYS ON THEIR TENDENCY TO CRACK FORMATION IN THE PROCESS OF GAS WELDING. S. V. Abakyan and N. F. Lashko. Avtogennoe Delo, No. 12, 7-9(1951) Dec. (In Russian)

Investigation of Al-Cu, Al-Si and Al-Sn systems revealed considerable decrease in tendency of alloys to cracking when an alloy of the same system but with increased amount of alloying element was used as addition in the welding process. In this case, temperature of complete melting was lower and mixing of weld metal with base alloy was less intensive, keeping composition of weld metal more constant and preventing formation of crystallization cracks.

6366
NEW PHASES IN THE SYSTEMS ALUMINUM – GERMANIUM – SODIUM AND ALUMINUM – GERMANIUM – LITHIUM. E. A. Boom. Doklady Akad. Nauk S.S.S.R. 84, 697-9(1952) June 1. (In Russian)

6367
PROPERTIES OF CAST STEELS IMPROVED WITH RARE EARTH ELEMENT ADDITIONS. G. A. Lillieqvist and C. G. Mickelson. J. Metals (N. Y.) 4, 1024-31(1952) Oct.

Addition of an alloy of rare earths known as LanCerAmp to cast steels had a beneficial effect on almost all properties, and in no case was any detrimental effect experienced. Improvements were noted in ductility, impact strength, in-

clusions, hot tears, fluidity, sulfur reduction, porosity, weldability, and feedability.

6368
DYNAMIC FORMATION OF SLIP BANDS IN ALUMINUM. N. K. Chen and R. B. Pond. J. Metals (N. Y.) 4, 1085-92 (1952) Oct.

An experimental apparatus has made possible the recording of the progressive formation of slip bands in an Al specimen undergoing plastic deformation. Propagation of slip bands at finite rates from zero to 7600 μ/sec was observed at positions corresponding to the head of the slip direction. A similar propagation of slip bands at positions parallel to the slip direction has not been observed to date. In the former case, data of propagation of 30 slip bands have been presented together with stress rate and strain rate. Strain hardening has been found to have the effect of retarding the rate of propagation of slip bands. The unit process of slip is considered as a shear of a row, or rows, of atoms in the slip direction and the growth phenomenon of a slip band is considered as resulting from progressive participation in the shearing process by successive rows of atoms. Characteristics associated with slip propagation such as the direction of propagation, the "overlap" of slip bands, and the sequential addition of slip bands are analyzed. It is concluded from the geometry of the addition of slip bands that one slip band can extend its hardening effect to its neighbors. (auth)

6369
STRAIN SENSITIVITY OF COMMERCIAL PURITY TITANIUM. James L. Wyatt. J. Metals (N. Y.) 4, 1050(1952) Oct.

The strain sensitivity, K, a property of metals defined as the unit change in electrical resistance per unit strain, was measured for commercial purity Ti wire to determine its usefulness as a strain gage material. A Kelvin double bridge, accurate to 0.000001 ohm, was used to make measurements from 0 to 1% total strain. A positive value of 0.17 for K was found. This compares with 2.15 for constantan and 3.5 for cold-worked invar, two of the more common strain gage materials. The effect of temperature also was determined. It was found that a change in temperature of 30°F caused the same resistance change as 1% strain. It is therefore concluded that Ti would have utility as a strain gage only if the thermal fluctuations in the specimen could be controlled to a high degree and in applications of very large total strain. (Entire note)

6370
INVESTIGATION BY PILE IRRADIATION OF INTERGRANULAR AND INTERDENDRITIC SEGREGATION OF TRACES OF IMPURITIES IN VERY PURE ALUMINUM. Frédéric Montariol, Philippe Albert, and Georges Chaudron. Compt. rend. 235, 477-80(1952) Aug. 18. (In French)

Accumulation of impurities between grains and dendritic structures of 99.998% Al was disclosed by radioautography of pile-irradiated samples and of samples to which radioactive Zn or Ru has been added.

PHYSICS

6371
Ohio State Univ
SOME PROPERTIES OF SUPERCONDUCTORS BELOW 1°K. III. ZIRCONIUM, HAFNIUM, CADMIUM AND TITANIUM, by T. S. Smith and J. G. Daunt. [nd] 21p. (AECU-2239)

Using techniques for the measurement of the magnetic threshold curves of superconductors below 1°K previously employed, investigations have been made on Cd, Zr, Hf, and Ti, both before and after heat treatment. It was found that in Zr and Hf the magnetic superconducting properties were profoundly affected by heat treatment and that only after suitable annealing did these properties approach those of an ideal superconductor. The results for the annealed metals were as follows: the transition temperature, T_c, in zero magnetic field was 0.602°K for Cd, 0.546°K for Zr, 0.374°K for Hf, 0.558°K for Ti and the slope of the magnetic threshold curves at $T = T_c$ in gauss/degree was 112 for Cd, 170 for Zr, 230 for Hf, and 450 for Ti. The magnetic threshold curves for Cd and Zr were parabolic with $H_0 = 33.8$ gauss for Cd and 46.4 gauss for Zr. The thermodynamically computed specific heat of the normal electrons was $1.54 \times 10^{-4}T$ cal/mole-deg for Cd and $3.92 \times 10^{-4}T$ cal/mole-deg for Zr. No thermodynamic computations were made for Hf and Ti owing to the irreversibility of their superconducting transitions. (auth)

6372
Ohio State Univ.
THE SPECIFIC HEAT OF LEAD IN THE TEMPERATURE RANGE 1°K TO 75°K, by M. Horowitz, A. A. Silvidi, S. F. Malaker and J. G. Daunt. [nd] 24p. (AECU-2240)

The specific heat of pure Pb in the temperature range 1° to 75°K has been measured calorimetrically, both in the normal and superconductive states. The measurements were made using a useful semiautomatic recording system. It was found that at the lowest temperatures (1° to 4°K) the lattice specific heat of Pb in the normal state was a T^3 function, with a Debye $\theta = 96.3$°K. It was found that the variation of θ with temperature over the whole range of temperature employed confirmed the theoretical computations made by Leighton for f.c.c. lattices. The normal electronic specific heat was found to be 7.48×10^{-4} T cal/mole-deg, in good agreement with results from magnetic measurements on superconducting Pb. The measured value of the electronic specific heat of the superconducting state was $C_{el,s} = 5 \times 10^{-4} T^3$ cal/mole-deg, in the temperature range 1° to 4°K, a result also in agreement with the magnetic measurements. (auth)

6373
[Wisconsin Univ.]
SUPERCONDUCTING–NORMAL TRANSITION IN TIN (abstract), by C. K. McLane. [nd] 2p. (AECU-2211)

The superconducting–normal transition in tin as effected by a sinusoidally varying magnetic field has been studied. The field was applied longitudinally to a cylindrical specimen of pure tin (99.99+% purity claimed by supplier, the Vulcan Detinning Company). The specimen, which was approximately 10 cm long by 3 mm diameter, was prepared by a method which should produce a single crystal. However, no crystallographic examination has been made, and it is quite possible that handling of the specimen subsequent to its preparation changed its crystalline state. The magnetic field was produced by a small solenoid, immersed in the liquid helium, whose field constant was obtained by computation from its dimensions. The change in magnetic flux through the specimen was picked up by a coil placed about it, and the induced voltage was displayed on an oscilloscope screen. From a photograph of the oscilloscope trace the phase at which the state transitions began could be obtained by measurement and hence the critical field values could be determined. Because the earth's field was not eliminated during these measurements, it was necessary to make the above measurements for both positive and negative half cycles of the applied magnetic field. The two values of the transition fields so obtained could then be used to eliminate the component of the earth's field along the specimen axis and evaluate the critical field. Implicit in this treatment of the data is the assumption that superheating and supercooling are absent. No positive assertion can be made as to the validity of this assumption; however, it led to consistent results which are in sufficiently good agreement with existing data. The vertical component of the earth's field, as deduced from these data, was so erratic and so small as to

bear no apparent relation to the quantity we were trying to eliminate. No explanation can be offered for this. The critical field curve gave $T_c = 3.72°K$ (Leiden 1937 scale) and $\left(\frac{d\,Hc}{d\,T}\right)T_c = -153$ oersted/degree. If the data which extended from 0.4 to 3.3 gauss are least-squares-fitted by a parabola, the value of H_0 deduced is 285 oersteds. A low value is expected, due to the deviation from the parabolic law at these small fields; however, experimental errors in this work, extending over such a small range of low fields, are so large as to prohibit attaching much significance to this value. These measurements were made at frequencies varying from 20 to 500 cps. The points for all frequencies lay within experimental error on the same threshold field curve. It is interesting to note that in this type of experiment only the skin layer of the specimen changes state. The core will remain superconducting throughout the entire cycle if the temperature is below T_c. (Entire report)

6374

Ames Lab.

A NEW METHOD FOR DETERMINATION OF ACTIVITIES OF BINARY SOLUTIONS OF VOLATILE LIQUIDS, by Robert S. Hansen and Frederick A. Miller. Aug. 15, 1952. 14p. (ISC-261)

A new method for the determination of activities of both components in binary mixiures of volatile solvents is described. The method involves the transfer of vapor from a generator flask through an intermittent bleeder to a reservoir flask, measurement of total pressure in the reservoir flask, condensation and analysis of vapors in the flask. The intermittent bleeder appears essential to the transfer of vapor of equilibrium concentration to the reservoir. Activities of both components in water-methanol, water-ethanol, and water-propanol-1 systems determined by this method are given and compared with best literature values. It is concluded that the method described is comparable in accuracy to the transpiration method, and is approximately eight times as rapid. (auth)

6375

Yale Univ.

THE DE HAAS-VAN ALPHEN EFFECT IN ENRICHED TIN ISOTOPES, by Ted G. Berlincourt. [nd] 23p. (NP-4115)

The periodicity of oscillation of the anisotropy of the magnetic susceptibility, when plotted against the reciprocal of the magnetic field, is a reasonably reproducible feature in single crystals of Sn, while the amplitude of these oscillations is not very reproducible. A search was made for an isotopic shift in Sn by comparison of the periods of oscillation. No evidence was found of an isotopic shift in the de Haas-van Alphen effect in Sn, and it was concluded that there are at least two groups of electrons responsible for the effect in Sn.

6376

THE MEASUREMENTS OF SOIL MOISTURE AND DENSITY BY NEUTRON AND GAMMA-RAY SCATTERING. Donald J. Belcher. In FROST ACTION IN SOILS; A SYMPOSIUM. Highway Research Board Special Report No. 2; Publication 213 of Natl. Acad. Sci.—Natl. Research Council. (p.98-110)

Description is given of the neutron-scattering method for continuous moisture determination and the γ-ray scattering method for density determination of soils. The advantage of the apparatus employed in overcoming the ordinary problem of destructive auger sampling is emphasized.

6377

THERMODYNAMICS OF THE TRANSITION BETWEEN HELIUM I AND HELIUM II IN MIXTURES OF ^{3}He AND ^{4}He. J. De Boer and C. J. Gorter. Physica 18, 565-8(1952) Aug.-Sept.

The present note emphasises that, on the assumption that the transition of a liquid mixture of He^3 and He^4 from the He I phase into the He II phase is a transition of the second order, pure thermodynamic reasoning, not based on any particular model, leads to predictions about discontinuities in the derivatives of the vapor-to-liquid concentration ratio and certain other thermodynamic quantities at the transition line. (auth)

6378

TRANSPORT PHENOMENA OF LIQUID HELIUM II IN NARROW SLITS. C. S. Hung, B. Hunt, and P. Winkel. Physica 18, 629-45(1952) Aug.-Sept.

New measurements have been carried out on the flow of matter and heat in liquid He II through slits of 1 to 5 μ widths, in order to study the equations of motion of the normal fluid and the superfluid as proposed by Gorter and Mellink (Physica 15, 285(1949)). It is found, that, at high velocities, these equations can describe the observed phenomena very satisfactorily, and values of the coefficient of the mutual friction A are calculated for different slit widths. However, below a certain value of the superfluid velocity no friction is observed. A combined hypothesis for the two velocity ranges is given. (auth)

6379

CERTAIN PROBLEMS OF THE HYDRODYNAMICS OF HELIUM II. E. L. Andronikashvili. Zhur. Eksptl'. i Teoret. Fiz. 22, 62-5(1952) Jan. (In Russian)

The problem concerning the possibility of the existence of nondamping circular currents in He II is clarified. It is shown that under the conditions of the present experiments such currents of superfluid liquids do not occur.

COSMIC RADIATION

6380

SECONDARY PENETRATING COMPONENT OF μ MESONS. Dan Kessler and Roland Maze. Physica 18, 528-48(1952) Aug.-Sept. (In French)

Several experiments giving evidence for the existence of a penetrating secondary radiation due to μ mesons, at sea level and underground, are described. This radiation is formed of showers of particles whose range is 42 ± 3 g/cm^2, probably similar to those found by George and Evans (NSA 5-634, 5-5822) in nuclear emulsions. Cross section for the creation of these showers by μ mesons is about 1.6 ± 10^{-29} cm^2 per nucleon. (auth)

6381

ABSORPTION OF GAMMA RADIATION IN THICK LAYERS OF LEAD AND THE SECOND MAXIMUM IN THE SHOWER CURVE OF COSMIC RADIATION. J. Clay, C. Wansdronk, and J. Dekker. Physica 18, 582-6(1952) Aug.-Sept.

Concerning the absorption of γ rays in thick layers of Pb (20 to 30 cm) some authors report irregularities and think that these may be the origin of the second maximum and of a third maximum (if any) in the shower curve of cosmic radiation. Careful measurements were therefore made of the absorption of γ radiation of about 30 mc of Na^{24} (2.7 Mev) and of 100 mc of Ra (1.7 to 2.2 Mev) by layers of Pb from 10 to 30 cm. No irregularities exceeding the uncertainty of observation were found. (auth)

6382

THE EFFECT OF LATITUDE ON LOCAL PENETRATING COSMIC RAY SHOWERS AT HIGH ALTITUDES. Thomas G. Walsh. Ph.D. Thesis, Fordham Univ., 1951.

A value for the absorption mean free path in air of hard showers and an estimate of the energy of the hard-shower-producing particles are determined. The latitude effect at sea level and at airplane altitudes on μ mesons, the normal penetrating component of cosmic rays, is confirmed.

6383
CASCADE CURVE IN HEAVY ELEMENTS. V. Ya. Faĭnberg. Zhur. Eksptl'. i Teoret. Fiz. 22, 112-19(1952) Jan. (In Russian)

It is shown that the formulas for determining the nth moment of the distribution function of delta-form incident spectrum, obtained by Belen'kiĭ (Zhur. Eksptl'. i Teoret. Fiz. 14, 384(1944)), are easily generalized to the case of an arbitrary initial spectrum of particles. With the formulas obtained, the first two moments in Pb are calculated taking into consideration the dependence of σ on energy, on the assumption that the initial distribution of photons possesses the form 1/E.

6384
AN UNUSUAL COSMIC-RAY STAR. B. Twarowska. Compt. rend. classe sci. mat. et nat., Acad. polon. sci., 10-11(1951) Mar.-Apr. (In French)

A five-prong event observed in a Ilford C2 plate exposed at only 121 m altitude was analyzed. It was deduced that an incident neutron of 110 Mev energy caused the reaction $O^{16} + n \rightarrow 3\alpha + 2p + 3n$.

6385
SCATTERING OF SHOWER PARTICLES IN HEAVY ELEMENTS. S. Z. Belen'kiĭ and B. I. Maksimov. Zhur. Eksptl'. i Teoret. Fiz. 22, 102-11(1952) Jan. (In Russian)

A recurrence formula is derived that permits successive calculation of the moments of the distribution function of shower particles taking into account scattering. The function giving the angular distribution of shower particles, averaged with respect to depth, is found without any assumption concerning the smallness of the scattering angles and with consideration for the angle of ionization loss. On the basis of these results, the influence of scattering on the form of the cascade curve is evaluated more accurately.

6386
THE ENERGY SPECTRUM OF THE SOFT NONEQUILIBRIAL COMPONENT OF COSMIC RAYS. I. L. Rozental. Zhur. Eksptl'. i Teoret. Fiz. 22, 92-101(1952) Jan. (In Russian)

The energy spectrum of shower electrons and photons formed as a result of cascade multiplication of particles in equilibrium with the component whose flight is comparable with that of the shower is computed. It is established that the energy spectrum of the nonequilibrial component is "softer" than the equilibrial spectrum of Tamm-Belen'kiĭ (J. Phys. U.S.S.R. 1, 177(1939)). In particular, the nonequilibrial spectrum is computed for the case in which the component forming the electrons consists of nuclear-active particles of high energy.

6387
PRODUCTION CROSS SECTION AND FREQUENCY OF NEUTRAL MESONS IN COSMIC RAYS. G. Salvini and Y. B. Kim. Phys. Rev. 88, 40-50(1952) Oct. 1.

Nuclear interactions have been observed in a large cloud chamber operated at Echo Lake, Colorado, altitude 10,500 ft. The events were produced by ionizing particles (protons) in NaI crystals inside the cloud chamber, and were detected by photomultipliers. In this paper the electromagnetic component associated with the nuclear events is studied as evidence for the properties of the neutral meson whose decay is assumed to be the source of this component. The results are consistent with the assumption that the π^0 mesons are the main source of the photons associated with the nuclear events. The probability of production of π^0 mesons is in agreement with the theoretical results of Fermi, within the limits of the large experimental errors. The ratio of the number of neutral π^0 mesons to the number of the charged $\pi^\pm$ mesons is estimated in events of different multiplicities of shower particles and it is found to be close to 0.5 for events with multiplicity varying from 1 to 5 or more (corresponding to energies of from 1 to about 20 bev for the producing protons). These results agree with the results of other experimenters, if all the possible systematic errors are taken into account. The estimated energy distribution of the π^0 mesons emitted is given. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6388
Brookhaven National Lab.
NEUTRON DIFFRACTION STUDIES OF ZINC FERRITE AND NICKEL FERRITE, by J. M. Hastings and L. M. Corliss. [nd] 30p. (BNL-1240)

The chemical and magnetic structures of Zn ferrite and Ni ferrite have been investigated at room temperature by means of neutron diffraction. In agreement with previous x-ray investigations Zn ferrite has been found to possess a completely regular spinel structure with an oxygen parameter of 0.385 ± 0.002. The diffraction peaks show no evidence of coherent magnetic scattering, whereas the background exhibits normal paramagnetic diffuse scattering. This eliminates the possibility of an antiferromagnetic structure at room temperature. In the case of Ni ferrite, calculated intensities based upon an inverted structure and the Néel model of antiferromagnetism are in good agreement with the observed intensities. (auth)

6389
Massachusetts Inst. of Tech.
THE SEPARATION OF COLD WORK DISTORTION AND PARTICLE SIZE BROADENING IN X-RAY PATTERNS, by B. E. Warren and B. L. Averbach. Mar. 31, 1952. 6p. (NYO-765)

For a cubic crystal it is always possible to choose orthogonal axes so as to make any reflection have the indices (OOl). If both distortion broadening and particle-size broadening are present, the measured coefficient is $A_n(l) = A_n^P A_n^D(l)$, where $A_n^D(l)$ and A_n^P are the coefficients of distortion and particle-size broadening, respectively. For small l, and small values of n where Z_n is also small, $\langle\cos(2\pi l\, Z_n)\rangle$ can be approximated by $\ln A_n(l) = \ln A_n^P - 2\pi^2 l^2 \langle Z_n^2\rangle_{AV}$. For several orders of a particular set of planes, a plot of $\ln A_n(l)$ vs. l^2 gives a straight line for small values of l. A plot of $\ln A_n(l_0)$ vs. l_0^2 for the first five orders of (111) is shown for a single crystal of Cu–Si. The values of A_n^P obtained from the intercepts are plotted against $L = na_3$. The average particle size obtained, L = 1000 A, indicates that in the deforming of the crystal by rolling, the major part of the broadening is due to distortion, and the broadening by particle size is small but not small enough to neglect.

ELECTRICAL DISCHARGE

6390
THEORY OF PLASMA IN RAREFIED GAS IN THE CASE OF VARYING CURRENT STRENGTH. V. L. Granovskiĭ. Zhur. Eksptl'. i Teoret. Fiz. 22, 3-10(1952) Jan. (In Russian)

The general equations of comparatively slow nonstationary processes in plasma (during which processes the regimé of ambipolar diffusion is preserved) are applied to the computation of the concentration of electrons and ions in the case in which the strength of the independent current in the gas varies. The problem concerning the partial deionization of gas is considered for decreasing current strength, and the residual concentration of electrons and ions after complete cessation of the independent current is calculated.

6391
THE FORMATION OF STRATA IN GAS DISCHARGE. B. N. Klyarfel'd. Zhur. Eksptl'. i Teoret. Fiz. 22, 66-77(1952) Jan. (In Russian)

Study of the conditions governing the formation of strata (striae) indicates that they occur at such pressures that not less than 10 collisions of an electron with molecules of the gas occur between the heads of neighboring strata (striae).

6392
ARC FORM OF NOBLE GAS HIGH-PRESSURE DISCHARGE. Kurt Larché. Z. Physik 132, 544-52(1952). (In German)

In order to determine the reason for the low stability of high-pressure discharge in the noble gases, the factors responsible for the shape of the arc were investigated experimentally. It is shown that, in a freely burning arc, a cathode stream or jet of gas strongly affects the shape of the arc.

ELECTRONS

6393
AVERAGE VELOCITY OF ENERGY IN A HETEROGENEOUS IONIZED ABSORBING MEDIUM WITH SLOWLY VARYING PARAMETERS. Henri Arzeliès. Compt. rend. 234, 421-3 (1952) Aug. 11. (In French)

An expression is derived for the mean transfer velocity of electromagnetic energy and kinetic energy of ions in an ionized medium, such as the ionosphere.

GASES

6394
Los Alamos Scientific Lab.
A HIGHLY EFFECTIVE CATALYST FOR THE ORTHO-TO-PARA HYDROGEN CONVERSION, by E. R. Grilly. [nd] 4p. (AECU-2245; LADC-1261)

A highly effective catalyst for converting ortho to para hydrogen consists of 30 to 35% Cr_2O_3 on gel Al_2O_3. At 76.3°K, one liter of the catalyst will produce 50% para at the rate of 77 STP liter/minute at 1500 psia and 58 STP liter/minute at 68 psia. (auth)

6395
Radiation Lab., Univ. of Calif., Berkeley
THERMAL CONDUCTIVITY OF GASES AT MODERATE PRESSURES, by LeRoy A. Bromley. June 12, 1952. 37p. (UCRL-1852)

An equation is developed from theory and experimental data to enable one to calculate the group, $k/\eta C_v$. From this, one may calculate the conductivity k if the viscosity η and constant volume heat capacity C_v may be calculated or estimated. Literature data are tabulated for k, η, $C_{v,\gamma} = C_p/C_v$ and $k/\eta C_v$. The average deviation between calculated and experimental values of $k/\eta C_v$ for 186 points on 48 different gases is ±4%. The maximum deviation is 15%. (auth)

INSTRUMENTS

6396
David Sarnoff Research Center
QUARTERLY REPORT NO. 8 [ON] ELECTRONIC DEVICES FOR NUCLEAR PHYSICS [FOR] APRIL, 1952–JULY, 1952, by G. A. Morton, L. E. Flory, P. W. Davison, M. W. Green, M. H. Greenblatt, K. W. Robinson, A. S. Jensen and G. W. Gray. Sept. 3, 1952. (AECU-2212; Quarterly Report No. 8)

Studies are reported in the design of photocathode multiplier tubes for use in γ-ray spectrometry. Results of investigations on simple photodiodes, which were preliminary to the production of high-sensitivity photocathodes, are reported. By means of new techniques developed, photocathode sensitivities of 90, 100 and 120 μa per lumen were achieved with a high degree of uniformity. Preliminary studies of noise and resolution measurements are reported.

6397
[Los Alamos Scientific Lab.]
MANIAC: THE LOS ALAMOS COMPUTER, by [John B. Jackson]. [nd] 11p. (AECU-2230; LADC-1248)

A description is given of this general-purpose electronic computer, with discussion of its operation, including problem preparation, operating techniques, and testing. The performance data include component failures, the efficiency of operation, and the frequency of use of the various kinds of orders given to the computer.

6398
HIGH-SPEED COUNTER USES TERNARY NOTATION. Richard Weissman. Electronics 25, No. 10, 118-21(1952) Oct.

A counter based on powers of three attains high counting speeds, using fewer tubes than conventional counters. The circuit described operates reliably up to 175,000 counts/sec, using only nine stages. Application of the circuit in fast nuclear scalers is predicted.

6399
MEASUREMENT OF THE FIRST AND SECOND DERIVATIVES OF INDUCTION ON THE AXIS OF REVOLUTION OF A STRONG MAGNETIC LENS. Pierre Gautier. Compt. rend. 235, 361-4(1952) Aug. 4. (In French)

A small probing coil, the axis of which coincides with that of the lens, oscillates sinusoidally parallel to the axis; the induced emf is proportional to the first derivative of the induction. Two similar coils in opposition give an induced emf proportional to the second derivative. These derivatives are necessary to calculate third-order aberrations.

ISOTOPES

6400
ISOTOPIC COMPOSITION OF CARBON IN MAGMATIC ROCKS. A. V. Trofimov. Doklady Akad. Nauk S.S.S.R. 85, 169-72(1952) July 1. (In Russian)

The C^{12}/C^{13} ratios of various granites, basalts, and other magmatic rocks of the Soviet Union were determined. The average ratio, 92.0, is similar to that in meteorites and organic carbon (asphalt, petroleum, etc.) and considerably exceeds the ratio in carbonate rocks (~90.0 in calcite, dolomite, etc.).

ISOTOPE SEPARATION

6401
ISOTOPE EFFECT IN THE ELECTROLYTIC MIGRATION OF ZINC IONS IN MOLTEN ZINC BROMIDE. Alfred Klemm, Einar Lindholm, and Arnold Lundén. Z. Naturforsch. a7, 560-4(1952) Aug. (In German)

The light Zn isotopes were concentrated at the boundary between molten $PbBr_2$ and $ZnBr_2$ by electrolytic transport for 2.4 days at 140 ma current, 2.75 amp/cm^2 current density, 2 meters shift of Br relative to Zn, and 500°C. The mass effect $\mu = -0.111$ between Zn^{64} and Zn^{66} agrees with the prediction of a semiempirical equation. The theory and previous measurements are considered briefly.

MASS SPECTROGRAPHY

6402
Chicago Univ.
MULTIPLE FILAMENT SURFACE IONIZATION SOURCE, by Mark G. Inghram, Univ. of Chicago and Argonne National Lab. and William A. Chupka, Mallinckrodt Chemical Lab., Harvard Univ. Sept. 1952. 6p. (AECU-2242; UAC-639)

A new multiple-filament surface ionization source has been developed which, for the elements investigated (Gd, U, Ni), is many times more efficient than the single-filament surface ionization source. Emission from the source can be shifted from the oxide to the metal position or vice versa by appropriate adjustment of temperatures. Because of the high efficiency of the source it is possible to look at the sample during a number of successive evaporations. Use of this source should eliminate the necessity of using electron multiplier ion detection for some elements. (auth)

MATHEMATICS

6403

CONSERVATION LAWS FOR FIELDS OF ZERO REST MASS. I. James A. McLennan, Jr. and Peter Havas. Phys. Rev. 87, 898(1952) Sept. 1.

It is found that Gårding's relativistically invariant sets of linear differential equations (Proc. Cambridge Phil. Soc. 41, 49(1945)), which describe waves fields of zero rest mass, admit the conservation laws of Bessel-Hagen (Math. Ann. 84, 258(1921)) for the electromagnetic field.

6404

CONSERVATION LAWS FOR FIELDS OF ZERO REST MASS. II. Peter Havas. Phys. Rev. 87, 898-9(1952) Sept. 1.

It was found that the system of particle and field does not obey all the laws obeyed by the field alone for the conservation equations considered. Conversely, if the system is required to possess all conservation properties of the field alone, no equations of motion will be obtained. The solution may possibly be found by requiring the equations of the special theory of relativity to fit within the framework of general relativity.

6405

TABLES FOR THE ANALYSIS OF BETA SPECTRA. U. Fano. Natl. Bur. Standards (U.S.), Applied Math. Ser., No. 13(1952) 61p.

A review of the principles of the analysis of β spectra is given with instructions on the use of the accompanying tables. The main tables give the value of the so called Fermi function, $f(Z,\eta)$, where η = momentum of the electron, after its ejection from the atom, in units of mc. It is suggested that the tables may find use in the study of atomic problems other than those connected with β spectra, inasmuch as the calculation of the Γ function involved is necessary for an evaluation of an effect due to the motion of electrons through atoms.

6406

THE VARIATIONAL METHOD FOR PROBLEMS OF NEUTRON DIFFUSION AND OF RADIATIVE TRANSFER. Su-Shu Huang. Phys. Rev. 88, 50-2(1952) Oct. 1.

The functional as proposed by R. E. Marshak for solving certain inhomogeneous integral equations by the variational method is modified in such a way that the simultaneous equations which determine the parameters become linear. Thus this type of integral equation can be solved with an accuracy as high as required without much labor. As an illustration the present method is used to obtain an approximate solution of Milne's integral equation for the neutron density (or for the source function in the problem of radiative transfer) in a simple form. The approximate solution agrees (for the first four figures) everywhere with the one computed by C. Mark from the exact solution. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

6407

Argonne National Lab.

DETERMINATION OF PHOTOGRAPHIC FILM EXPOSURE BY ACTIVATING Ag^{109}, by Isadore B. Berlman. Aug. 1952. 5p. (AECU-2231; UAC-616)

A method is described for the determination of photographic film exposures to γ radiation after neutron activation of Ag^{109} into Ag^{110}. The abundant emission of γ rays from Ag^{110} permits measurements with absorbers thick enough to eliminate all β activity, and the half life permits measurements to be made after the decay of activated impurities in the emulsion. Results of measurements made on a set of calibrated du Pont No. 512 films after exposure to a flux of the order of 10^{11} n/sec for 40 min are presented in tabular form.

6408

Argonne National Lab.

EFFECT OF SPACE CHARGE ON SATURATION PROPERTIES OF IONIZATION CHAMBERS, by A. C. Lapsley. Aug. 1, 1952. 22p. (AECU-2233; UAC-628)

Experiments on cylindrical ionization chambers operating at high current densities showed that more voltage was required to produce saturation when the central electrode was negative. An analysis is made which indicates this phenomenon might be explained by the positive-ion space charge. Under the condition of uniform ionization density within the chamber, a relation is developed for the ratio of voltages required to overcome the space charge for the two collection polarities. Also, approximate analyses are made for the cases of the ionizing particles originating at the surface of either electrode. There is rough agreement between the calculations and experimental data. (auth)

6409

Argonne National Lab.

MEASUREMENTS OF SCINTILLATION LIFETIMES, by H. Bruce Phillips and Robert K. Swank. Aug. 1952. 18p. (AECU-2243; UAC-636)

A pulsed x-ray method was used for measuring the decay time of luminescence of three commonly used organic scintillators. The design of the x-ray tube and the arrangement of the accompanying electrical apparatus is outlined. Particular care was taken to minimize the time dispersion effect of the apparatus and to increase the pulse size of the scintillation. The luminescence decay curves for anthracene, stilbene, and diphenyl acetylene scintillators are shown.

6410

Argonne National Lab.

DETECTION OF NEUTRONS BY LIQUID SCINTILLATORS, by C. O. Muehlhause and G. E. Thomas, Jr. Aug. 28, 1952. 21p. (AECU-2244; UAC-634)

Two types of counters are described. The first operates as a simple detector with a single pulse. It is highly efficient for neutrons of energy less than a few Mev, but possesses some γ sensitivity and responds in a time ~0.5 μsec. The second is superior for detection of fast neutrons ($E_n \leq 200$ kev), is not sensitive to γ rays and slow neutrons, and responds in a time ~5 mμsec. Neither detector can perform as a spectrometer by pulse height discrimination, but is suitable for use with time-of-flight equipment. (auth)

6411

Brookhaven National Lab.

NEUTRON MONOCHROMATOR CRYSTALS – Fe_3O_4 AND Ge, by A. W. McReynolds. July 25, 1952. 5p. (BNL-1243)

It was found that Ge crystals and natural magnetic crystals of Fe_3O_4 partly satisfy the necessary characteristics for monochromator crystals for longer wavelengths. These properties are a large lattice spacing, large angular spread of the crystal mosaic or lineage structure and the absence of higher-order reflections.

6412

Purdue Research Foundation

RESEARCH WITH CRYSTAL COUNTERS AND SCINTILLATION COUNTERS (final report), by George Goldsmith and Lee Aukerman. Feb. 13, 1952. 34p. (NP-4012)

Techniques currently in use for growing large single crystals of organic phosphors are described; the furnaces used are sketched. A circuit is diagramed for a sensitive vacuum-tube electrometer for measurement of the total current produced in a multiplier phototube by the luminescence from liquid, solid, or plastic phosphors. Apparatus for the measurement of pulse characteristics of phosphors and designed to minimize the effects of the phototube background pulses is described and sketched. This also provides for the analysis of the pulse-height distribution through use of a single-

channel pulse-height analyzer. Measurement of the photoconductivity of organic materials in organic solvents is to be carried out with refined techniques; the apparatus to be used is described.

6413

DePaul Univ.

FIRST QUARTERLY PROGRESS REPORT [FOR] 1 APRIL 1952–30 JUNE 1952 [ON] SCINTILLATION TECHNIQUES APPLIED TO ELECTRON ENERGY STUDIES, by Edwin J. Schillinger, Jr. [nd] 17p. (NP-4018; U-23327)

Work was directed toward constructing and testing a scintillation counter for detecting low-energy electrons above background pulses and an electron accelerating system with moderately good focusing characteristics. A counter was built which employs standard techniques. To improve signal-to-noise ratios in the RCA 5819 phototube circuit, the following parameters were made variable: voltage between the cathode and first dynode, voltage between the last dynode and the ground, and the anode-to-ground resistance. Small capacitors were placed across the last 3 resistors of the voltage divider used to distribute potentials among the dynodes. This tended to minimize the drop in voltage across the last stages when the tube was conducting. The general linearity of the counter circuits, as tested with the positive gate pulse from a Tektronix oscilloscope, was good; the counter was operated at the minimum acceptable S/N ratio. An accelerating chamber was designed which consisted of 3 cylindrical electrodes, the standard vacuum system (10^{-6} mm Hg), and general circuitry. (NRS abst.)

6414

Harshaw Chemical Co.

PREPARATION AND PERFORMANCE OF SOME SCINTILLATION CRYSTALS, by J. A. Harshaw, H. C. Kremers, E. C. Stewart, E. K. Warburton and J. O. Hay. Sept. 10, 1952. (NYO-1577)

Various phases of scintillation crystal growth and operation are reported. The work covers purification of material and growth of crystals of trans-stilbene and terphenyl; development of methods of measuring performance of scintillators; study of thallium-activated sodium iodide to determine the effect of production variables on operation and to develop production methods of finishing and mounting this material to obtain good performance; and development of lithium-bearing crystals for use as neutron detectors (this work included preparation and growth of crystals as well as performance testing). A brief section is included containing pulse height measurements on various other scintillators not mentioned elsewhere in the report.

6415

Oak Ridge National Lab.

INSTRUMENT RESEARCH AND DEVELOPMENT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING APRIL 20, 1952. Issued Sept. 22, 1952. 20p. (ORNL-1336)

Graphs are presented of the energy resolution of γ rays by a scintillation spectrometer consisting of a 5819 photomultiplier tube on which is mounted any of various-sized NaI crystals. Data on effect of surface treatment of the crystal and comparative effects of MgO and Al-foil reflectors are tabulated. Variations in energy resolution among 50 type-5819 photomultipliers and among 14 commercial NaI crystals are analyzed. Progress on design and construction of various instruments is reported briefly.

6416

THE IONIZATION BALANCE OF THE ATMOSPHERE. Roger P. Vancour. Ph. D. Thesis, Fordham Univ., 1951.

The four components of the atmospheric ionization, namely, (1) residual ionization, (2) γ rays from the radioactive substances in the soil, (3) γ rays from the radioactive products of radon, thoron, and actinon in the atmosphere, and (4) cosmic rays were measured separately by means of appropriately shielded, hermetically-sealed ionization chambers. The desired measurements were obtained by varying the filling gas, the gas pressure, and the amount and direction of the shielding. The determined total ionization agrees with the calculated value at the point of observation.

6417

FAST COINCIDENCES WITH ČERENKOV COUNTERS. Z. Bay, M. R. Cleland, and F. McLernon. Phys. Rev. 87, 901-2(1952) Sept. 1.

The resolving-time limitations of Cherenkov counters were studied in preparation for coincidence experiments with high-energy particles. It was found that the random time fluctuations for these counters are shorter in spite of the smaller number of photoelectrons than those presently found for scintillation counters.

6418

A NEW TECHNIQUE FOR THE MEASUREMENT OF AGE BY RADIOCARBON. Hl. de Vries and G. W. Barendsen. Physica 18, 652(1952) Aug.-Sept.

In age estimations of archeological material, use of a CO_2-filled proportional counter has several advantages over the use of Libby's screen-wall counter. The difficult preparation of pure carbon, disassembly of the Geiger counter for each sample, and low efficiency in the latter process are avoided.

6419

SOME EFFECTS OF IONIZING RADIATION ON THE FORMATION OF BUBBLES IN LIQUIDS. Donald A. Glaser. Phys. Rev. 87, 665(1952) Aug. 15.

For cosmic-ray studies of high-energy interactions it would be desirable to have available a cloud-chamber-like detector whose sensitive volume is filled with a hydrogen-rich medium with density of the order of 1 g/cc. It seemed promising to try to make a device that takes advantage of the instability of superheated liquids against bubble formation in the same way that a Wilson cloud chamber utilizes the instability of supercooled vapors against droplet formation. An experimental test of the theory for radiation-induced ionization was made by maintaining diethyl ether in a thick-walled glass tube at a temperature near 130°C and under a pressure of about 20 atm. In the presence of a 12.6-mc Co^{60} source, the liquid in the tube always erupted as soon as the pressure was released, whereas when the source was removed time delays between the time of pressure release and eruptive boiling ranged from 0 to 400 sec with an average time of about 68 sec. A "coincidence telescope" consisting of two parallel tubes was constructed and coincidences apparently resulting from vertical cosmic rays were observed with roughly the expected ratio of single to coincident eruptions.

6420

LOW-ENERGY δ RAYS DUE TO α RAYS AND PROTONS. Pierre Demers and Zofia Lechno Wasiutynska. Compt. rend. 235, 474-5(1952) Aug. 18. (In French)

A fine-grain emulsion prepared by the authors has permitted δ rays of only 5 kev energy to be distinguished and counted. This contrasts with the minimum discernible energy of 20 kev for Ilford G5 emulsion. Particles having velocities as low as $\beta = 0.07$ may now be distinguished by δ-ray counting. Tracks of α particles and protons are illustrated.

6421

MEASUREMENT OF β AND γ RADIATION DOSE FROM RADIOACTIVE SUBSTANCES IN ROENTGEN UNITS. G. Breitling and R. Glocker. Naturwissenschaften 39, 400(1952) Sept. (In German)

The problem of determining both β and γ doses by a single

counter can be solved by using an air-equivalent scintillation counter. The β/γ ratio can be found by interposing H_2O or a plastic screen between source and counter. Illustrative experiments with an anthracene-2-chloroanthracene detector and a Au^{198} source are summarized.

6422
THE USE OF SOLID SOLUTIONS OF para-TERPHENYL AND TETRAPHENYLBUTADIENE IN POLYSTYRENE AS SCINTILLATION PHOSPHORS. H. de Waard and J. E. P. Martini. Physica 18, 647-50(1952) Aug.-Sept.

Polystyrene cylinders containing 1.4% p-terphenyl or tetraphenylbutadiene and polymerized with 0.2% benzoyl peroxide for 100 hr at 70°C, then for 150 hr at 90°C, were irradiated with a collimated beam of Co^{60} γ rays. The absorption coefficient for the fluorescent light, integrated light output, and average pulse height were determined.

6423
THE ABSOLUTE DETERMINATION OF RESONANT ENERGIES FOR RADIATIVE CAPTURE OF PROTONS BY BERYLLIUM IN THE ENERGY RANGE BELOW 520 KEV. S. E. Hunt. Phys. Rev. 87, 902-3(1952) Sept. 1.

An electrostatic analyzer was used to determine absolutely the proton energy for which resonances occur in the reaction $Be^9(p,\gamma)B^{10}$ in the energy range below 520 kev. Thick-target yield curves indicated that the yield below 200 kev was extremely small. The thick-target curves could not be explained on the assumption of a single broad resonance at about 330 kev, since the yield continued to increase steeply up to 500 kev. (auth)

6424
SATURATION EFFECT OF PLASTIC SCINTILLATORS. C. N. Chou. Phys. Rev. 87, 903-4(1952) Sept. 1.

Comparison is shown graphically of the measurements made of the saturation effect in six plastic scintillators, a phenylcyclohexane solution, and a NaI crystal, using the negative pion beam and the outside proton beam of the Chicago cyclotron. Results indicate that the plastic scintillators show less saturation than the NaI crystal or the liquid phenylcyclohexane solution.

6425
THE NATURE OF THE SATURATION EFFECT OF FLUORESCENT SCINTILLATORS. C. N. Chou. Phys. Rev. 87, 904-5(1952) Sept. 1.

Mathematical analysis is given of the deviation from proportionality of the light output vs. energy loss in fluorescent scintillators.

MESONS

6426
Rochester Univ.
X-RAYS FROM THE π MESIC ATOM, by A. M. L. Messiah and R. E. Marshak. Sept. 10, 1952. 6p. (NYO-3701)

A theoretical interpretation of the role of nuclear shell structure in the absorption of slow π^- mesons is presented.

6427
Rochester Univ.
NUCLEAR CROSS SECTION FOR 37 MEV POSITIVE PIONS IN Pb, by Kenneth J. Button. Sept. 30, 1952. 6p. (NYO-3702)

Attenuation in Pb of a 50-Mev π^+ beam is reported. Three $1 \times 1 \times 0.2$-in. trans-stilbene crystals in a scintillation counter telescope defined the beam. A Pb attenuator plate, 5.248 g/cm^2, was placed between the third crystal and a fourth crystal. The fourth crystal was 2 in. in diameter and ½ in. thick. A Cu sheet, 710 mg/cm^2, was placed over the face of the fourth crystal. The attenuation observed yields a cross section of 1.30 ± 0.07 barns at a π^+ interaction energy of 37 ± 5 Mev.

6428
GENERATION OF π^+ MESONS DURING COLLISIONS OF PROTONS. R. Paruntseva. Zhur. Eksptl'. i Teoret. Fiz. 22, 123-6(1952) Jan. (In Russian)

A pseudoscalar variant of the meson field with pseudovector coupling is investigated, since it is just this variant that gives agreement with the experimental data on the generation of mesons from photons (cf. NSA 5-3746, 5-4831).

6429
FORMATION OF γ QUANTA AND NEUTRAL MESONS DURING CAPTURE OF π^- MESONS BY DEUTERONS. I AND II. B. L. Ioffe, A. P. Rudik, and I. M. Shmushkevich. Zhur. Eksptl'. i Teoret. Fiz. 22, 11-28(1952) Jan. (In Russian)

A brief exposition of the present detailed report was published in Doklady Akad. Nauk S.S.S.R. 77, 403-6(1951); NSA 5-6543.

6430
INTERACTION OF π MESONS WITH NUCLEONS. B. L. Ioffe and A. P. Rudik. Zhur. Eksptl'. i Teoret. Fiz. 22, 127-8(1952) Jan. (In Russian)

In order to clarify the application of meson theory to processes in which mesons of low energy ($\leq mc^2$) participate, weak meson-nucleon interaction being assumed, the authors compare briefly the results of their calculations on photoproduction, capture, and scattering of charged and neutral π mesons with experimental data. A pseudoscalar variant of meson theory was used in these calculations, the interactions being a mixture of pseudoscalar and pseudovector.

METEOROLOGY

6431
Brookhaven National Lab.
DISCUSSION OF VARIATION OF WIND VELOCITY AND GUSTS WITH HEIGHT, by Irving A. Singer and Maynard E. Smith. [nd] 5p. (BNL-1250)

This report is a discussion of Dr. R. H. Sherlock's paper "Variation of Wind Velocity and Gusts with Height." The criticism is offered that Dr. Sherlock's data were obtained from only one location and might not be representative. Studies based on data obtained by the Meteorology Group at Brookhaven National Laboratory are compared with Dr. Sherlock's results. Comparison of wind-speed profiles and gust factors casts doubt on the values chosen for the parameters, and Brookhaven data indicate that the value of the power in the wind profile equation may be as high as ⅓.

NEUTRONS

6432
Oak Ridge National Lab.
AN EXPERIMENTAL SEARCH FOR THE DINEUTRON. PART I. SEARCH FOR A STABLE DINEUTRON, by B. L. Cohen and T. H. Handley. Sept. 1952. 15p. (ORNL-1382)

An attempt is made to detect dineutrons (δ) emitted from hypothetical (p,δ) reactions by observing the activity of the end product of (δ,p) reactions. The activity expected, assuming the dineutron to be stable, is calculated from the statistical theory of nuclear reactions; it is greater than the upper limit of the observed activity by a factor of 10^5. The uncertainties in estimating the cross sections are discussed, and they appear to be far too small to explain the discrepancy. It is thus concluded that it is extremely unlikely that a dineutron can exist as a stable entity. Other experiments of this type reported in the literature are analyzed and found to be much less sensitive. The fact that the dineutron does not have a bound state indicates that the product of the well depth and the square of the range of the neutron-neutron potential cannot be more than 10% greater than for the singlet neutron-proton potential. (auth)

6433
Radiation Lab., Univ. of Calif., Berkeley
EXCITATION FUNCTIONS FOR PHOTONEUTRON PRODUCTION FROM 13.5 TO 70 MEV (thesis), by K. M. Terwilliger. Aug. 1952. 68p. (UCRL-1917)

Total neutron yields from eleven elements were obtained as a function of maximum beam energy of the University of California Hospital 70-Mev synchrotron. The maximum beam energy was varied from 13.5 to 70 Mev. The neutrons were detected at 90° to the beam axis with a BF_3 proportional counter in a long counter geometry. The beam was monitored by the e^+ activity of Cu^{62} produced by the reaction, $Cu^{63}(\gamma,n)Cu^{62}$. Excitation functions for total neutron production were calculated from the total yields by the photon difference method. The excitation functions show the same resonance-like behavior in the neighborhood of 20 Mev that has been observed in (γ,n) reactions. However, while the (γ,n) cross sections tend to drop to zero above the peak, the total neutron cross section curves have a flat tail to 65 Mev. With the use of calculated values of neutron multiplicity, the excitation function for γ ray absorption in tantalum was determined. The integral of this cross section from zero to 65 Mev, $\int_0^{65}\sigma\,dE$, was found to be 4.87 ± 20% Mev-barns. The total integrated cross section for tantalum predicted from the Levinger and Bethe theory is 3.66 Mev-barns for an exchange force fraction of one-half and 4.70 for an exchange force fraction of unity. Thus, the experimental result is consistent with the theory. With the use of estimated values of neutron multiplicity, the cross section for nuclear absorption of 45-Mev γ rays was found to be $\sigma = 0.128\ A \times 10^{-27}$ cm^2 where A is atomic weight. (auth)

6434
Radiation Lab., Univ. of Calif., Berkeley
NUCLEAR SCATTERING OF 300 MEV NEUTRONS (thesis), by William Paul Ball. Aug. 1952. 79p. (UCRL-1938)

A theoretical analysis of neutron scattering and a discussion of experimental procedures are presented. Measurement of elastic and inelastic scattering are described. Addition of the integrated elastic results and the inelastic cross sections yields values in agreement with corresponding total cross sections given in the literature.

NUCLEAR PHYSICS

6435
Radiation Lab., Univ. of Calif., Berkeley
NUCLEAR FORCES FROM PSEUDOSCALAR MESON THEORY, by M. Ruderman. July 1, 1952. 14p. (UCRL-1876)

Radiative corrections are calculated for the interaction of two nucleons through pseudoscalar coupled mesons. After renormalization these are very large for the usual magnitude of coupling constant but do not change the range of the potential or its shape at large distances. The tensor part of the nuclear force is relatively insensitive to these corrections. For the self-action terms the relevant expansion parameter in the perturbation theory is $g^2/4\pi$ with none of the factors of $\mu/2M$ which result when such terms are neglected. (auth)

6436
VARIATION OF NUCLEAR QUADRUPOLE MOMENTS WITH THE NUMBER OF NUCLEONS. D. Pfirsch. Z. Physik 132, 409-28(1952). (In German)

The Hartree model gives, not a spherically symmetrical, but a somewhat extended or flattened representation of the nucleus; a positive or negative nuclear quadrupole moment is the result. Variation of this moment with the nucleon number originates essentially from the first order of the nucleon energy eigenvalue perturbations with reference to a nuclear eccentricity parameter, whereas the second order affects only the general order of magnitude. The first order depends essentially on the spin and spin-orbit coupling of the particles and the configuration of the nucleons. The empirical quadrupole moment is approximated by nucleon configurations from the single-particle model with strong spin-orbit coupling; magic number influence is pronounced.

6437
PREDICTION OF β-STABLE NUCLEI OF EVEN MASS NUMBER. Raymond Moch. J. phys. radium 13, 415-23 (1952) July-Aug.-Sept. (In French)

The Bethe-Fermi semiempirical equation relating the atomic mass to A and Z should predict β-stable nuclei exactly. Comparison with experimentally determined lists of such nuclei having even A and Z shows many false predictions. Empirical corrections suggested by various investigators are considered, but the agreement is never perfect. The impossibility of using these semiempirical equations to predict the relative stability of isobaric nuclides is confirmed. Use of the variable $Z_m - P$, where $Z_m(A) = A/(1.98 + 0.015\ A^{2/3})$ and P is the largest even whole number in Z_m, is shown to be of value in predicting nuclear stability.

6438
COUPLING OF PHOTONUCLEONS IN THE SHELL MODEL OF THE NUCLEUS. K. H. Höcker. Z. Physik 132, 399-408(1952). (In German)

Effects of tensor forces on the energy states of excited nucleons are discussed. Magnetic-moment anomalies in the Schüler-Schmidt curves based on the nuclear shell model are explained.

NUCLEAR PROPERTIES

6439
Argonne National Lab.
SPIN-SPIN INTERACTION IN HD NUCLEAR RESONANCE, by B. Smaller, E. L. Yasaitis, E. C. Avery and D. A. Hutchison. Aug. 13, 1952. 2p. (AECU-2237; UAC-621)

The existence of a nuclear spin-spin interaction has been postulated by Hahn and Maxwell (Phys. Rev. 84, 1246(1951)) and McNeil, Slichter and Gutowsky (Phys. Rev. 84, 1245 (1951)) to account for the slow-beat phenomenon in the spin-echo nuclear resonance technique. Ramsey and Purcell (Phys. Rev. 85, 143(1952)) have proposed a second-order perturbation arising from higher electronic triplet states of the molecule to account for the interaction. For the case of the HD molecule they have calculated the magnetic level shifts to be approximately 70 $I_H.I_D$, which implies that the proton resonance in HD would consist of a triplet structure with a 70 cps separation between components. We have completed a series of measurements on the resonance line structure of the proton in H_2 and in HD which are in agreement with the predictions of Ramsey and Purcell. The equipment used has been described elsewhere (B. Smaller, Phys. Rev. 83, 812(1951)). The proton resonance in HD was obtained in a sample of H_2-D_2 that had been allowed to equilibrate under 1200 psi pressure for 18 months. A typical mass spectrometer analysis gave 4.2% H_2; 26.3% HD; 69.5% D_2 in good agreement with the assumption of a K_{eq} of 3.25. Resolution of the component lines was not feasible because of magnetic field homogeneity limitations, and thus resonance line 200 widths were the criteria of structure. Since relaxation times can contribute to line broadening, line width measurements were made on pure H_2 at 1200 psi and on a freshly prepared H_2-D_2 mixture where the H concentration was equal to that in the HD equilibrated sample. No significant difference in line width was detected. To insure that saturation broadening did not occur, the r-f power was kept well below the saturation value. To insure the constancy of the field inhomogeneity over the gas sample volumes, interchange of the gas samples was made without moving the position of

the gas chamber-coil-assembly in the magnet. The d-c sweeping field rate was calibrated in terms of cycles/sec by using a modulated r-f source and by noting the separation of the resonances due to the sideband frequencies. Operating at a radio-frequency of 30 Mc, the results of 30 measurements on the H_2 proton resonance gave a line width (full width at ½ maximum) of 109 ± 7 cps, while from 32 measurements of the H_2:HD proton resonances the average line width was found to be 138 ± 4 cps, the indicated error being the standard deviation of the mean. Obviously the triplet structure, revealed only in a broadening of the resonance line, cannot be deduced from the experimental evidence. However, with an a priori postulation of the structure, one can deduce quite easily, by graphical analysis, the required separation of components to give agreement with experiment. Taking into account both the H_2 and HD contribution to the line width, the required separation of components is found to be 52 ± 6 cps. The result can be considered in good agreement with the theoretical predictions since relatively crude wave functions (N. F. Ramsey, private communication) were used in predicting the separation. (Entire report)

6440

Palmer Physical Lab., Princeton Univ.

EFFECTS OF DEPARTURES FROM THE SINGLE PARTICLE MODEL ON NUCLEAR MAGNETIC MOMENTS, by A. de Shalit. June 16, 1952. 15p. (NYO-3661)

Departures from the single-particle model (SPM) are considered, in which the SPM wave function is mixed with others representing states for which the core has no longer zero angular momentum. It is found that under certain restrictions an experimentally established relation exists between the deviations of odd-N nuclei from the Schmidt lines and those of odd-Z nuclei. (auth)

6441

NUCLEAR MAGNETIC MOMENTS. C. R. Extermann, G. J. Béné, and P. M. Denis. Arch. sci. soc. phys. et hist. nat. Geneve 5, 65-83(1952). (In French)

A brief discussion and review are given of measurement techniques in and the significance to nuclear structure of nuclear magnetic moments. Most of the references are not specific, only the names of investigators being given.

6442

HYPERFINE STRUCTURE IN THE Pd I SPECTRUM AND NUCLEAR MOMENT OF Pd^{105}. Andreas Steudel. Z. Physik 132, 429-45(1952). (In German)

The hyperfine structure of the Pd I spectrum was investigated with a Fabry-Perot interferometer. The natural Pd isotopic mixture was used. A weak component was found in $4d^9 5s - 4d^9 5p$ transition lines ending in $4d^9 5s\ ^3D_3$ and $^1D_2$ terms. The nuclear spin of Pd^{105} is 5/2, and its magnetic dipole moment $\mu = -0.57 \pm 0.05$ n.m. Relative isotope shifts of Pd^{106}, Pd^{108}, and Pd^{110}, as well as Mo^{95} and Mo^{97}, are estimated.

6443

NUCLEAR MAGNETIC RESONANCE EXPERIMENT ON A FOUR-PROTON SYSTEM IN A SINGLE CRYSTAL OF $K_2HgCl_4.H_2O$. Junkichi Itoh, Riichiro Kusaka, Yukio Yamagata, Ryôiti Kiriyama, and Hideko Ibamoto. J. Chem. Phys. 20, 1503-4(1952) Sept.

The $K_2HgCl_4.H_2O$ crystal has rhombic symmetry (space group V_h^9 – Pbam) with four molecules to the unit cell. Fine structures were observed in each of the nuclear magnetic resonance lines separated by a two-proton interaction. These are ascribed to resonance absorption in a four-proton system. Location of the protons in the crystal structure was determined.

6444

THE SPIN AND MAGNETIC MOMENT OF V^{50}. A. Hitchcock. Phys. Rev. 87, 664(1952) Aug. 15.

In the j-j spin-orbit-coupling model, V^{50}, with 23 protons and 27 neutrons, has three protons and seven neutrons in the $1f_{7/2}$ shell. There are 42 different states available to such a configuration, with spins ranging from 0 to 11. The interaction energy of these states has been calculated. It is found that, for very short range forces, the four lowest states have spins 6, 4, 3, and 5, respectively. The energy of these four states and of the lowest state of spin-7 has been calculated for various forms of an extended-range interaction with convenient corresponding radial wave functions. The transition to the ground state of either Cr^{50} or Ti^{50} is fourth forbidden, corresponding to a half life of 10^{11} yr at least.

6445

NUCLEAR MAGNETIC RESONANCE IN METALS. I. BROADENING OF ABSORPTION LINES BY SPIN-LATTICE INTERACTIONS. H. S. Gutowsky and B. R. McGarvey. J. Chem. Phys. 20, 1472-7(1952) Sept.

Magnetic resonance line shapes and widths, their temperature dependence, and the conduction electron shifts in resonance frequency are reported for the metals Li^7, Na^{23}, Al^{27}, Cu^{63}, Cu^{65}, Ga^{69}, Ga^{71}, Rb^{85}, Rb^{87}, and Cs^{133}. The absorption lines in most of these metals are broader than predicted for nuclear magnetic dipolar broadening alone. It is proposed that the mechanism responsible for most, if not all, of this additional broadening is the interaction between the nuclear spins and the conduction electrons, which also determines the spin-lattice relaxation time. Spin-lattice relaxation times T_1 are estimated from the nondipolar broadening of the experimental absorption lines. These T_1 values compare favorably with available directly measured values and with approximate T_1 values obtained by Korringa's theory from the measured resonance shifts. In the case of Li, a dipolar line-width transition was observed at 255°K; this transition results from self-diffusion, for which is determined an activation energy of 9.8 ± 1 kcal/mole. (auth)

6446

THE MICROWAVE SPECTRA, STRUCTURE, DIPOLE MOMENT, AND CHLORINE NUCLEAR QUADRUPOLE COUPLING CONSTANTS OF METHYLENE CHLORIDE. Rollie J. Myers and William D. Gwinn. J. Chem. Phys. 20, 1420-7 (1952) Sept.

The microwave spectra of $CH_2Cl_2^{35}$, $CH_2Cl^{35}Cl^{37}$, $CH_2Cl_2^{37}$, $CDHCl_2^{35}$, $CDHCl^{35}Cl^{37}$, $CD_2Cl_2^{35}$, and $CD_2Cl^{35}Cl^{37}$ have been examined and effective moments of inertia have been determined for these seven isotopic species. From these data the effective bond distances and angles were determined as C–Cl distance = 1.7724 ± 0.0005 A, Cl–C–Cl angle = 111°47′ ± 1′, C–H distance = 1.068 ± 0.005 A (average of all species), or 1.082 A (extrapolated to infinite H mass), and H–C–H angle = 112°0′ ± 20′ (average of all species) or 112°58′ (extrapolated to infinite H mass). The best value for the dipole moment of methylene chloride was found from the Stark splitting to be $1.62 \pm 0.02 \times 10^{-18}$ esu. The Cl nuclear quadrupole coupling constants were also determined, and their relationship to the structure is discussed. (auth)

6447

ON THE PROBLEM OF MEASURING SPINS OF NUCLEI. A. S. Karamyan and K. A. Ter-Martirosyan. Zhur. Eksptl'. i Teoret. Fiz. 22, 40-55(1952) Jan. (In Russian)

The displacements ΔE in the levels of hyperfine structure in a magnetic field are calculated for atoms whose shell moment is greater than ½. Sixteen curves are constructed showing displacements of levels and of magnetic moments as function of field for atoms in the $P_{1/2}$ state.

6448
EXCITATION FUNCTIONS TO 100 MEV. Norton M. Hintz and Norman F. Ramsey. Phys. Rev. 88, 19-27(1952) Oct. 1.

A method is described for obtaining excitation functions using the stacked foil technique with an internal cyclotron beam. The method, which utilizes multiple coulomb scattering for deflection and 180° focusing for energy separation, has the advantages of good energy resolution, high intensity, and low background. Equations are presented for the particle orbits from which are derived the energy resolution and efficiency attainable. Absolute excitation curves are given for the reactions, $C^{12}(p,pn)C^{11}$; Na^{24}, Na^{22}, and F^{18} from Al^{27}; $B^{11}(p,n)C^{11}$; and $S^{34}(p,n)Cl^{34}$. Absolute cross sections are determined using the monitor reaction, $C^{12}(p,pn)C^{11}$, and the ratio of the β-counting rates. Various corrections to the relative and absolute excitation curves are discussed. A brief interpretation of the results is given in which it is argued that they are consistent with present ideas about high energy nuclear reactions. (auth)

6449
NEUTRON TOTAL CROSS SECTION FOR LEAD BETWEEN 37 AND 156 MEV. A. E. Taylor and E. Wood. Phys. Rev. 87, 907-8(1952) Sept. 1.

The variation of neutron total cross sections with energy, in the case of lead, in the 37 to 156 Mev range was investigated by means of the 110-in. Harwell cyclotron. A definite dip was found in the cross section at about 60 Mev.

6450
DISCONTINUITIES IN THE BINDING ENERGIES OF NEUTRONS AND PROTONS IN LIGHT NUCLEI. Martin G. Redlich. Phys. Rev. 88, 38-9(1952) Oct. 1.

Apart from even-odd variations, there is a peak in the binding energies of neutrons at N = 7, and of protons at Z = 7. Smaller peaks may exist at N or Z = 11 and 14. The curves are presented and discussed. (auth)

6451
ISOTOPE SHIFT EFFECTS IN THE ATOMIC SPECTRA OF THE RARE EARTHS. ISOTOPE SHIFT CONSTANTS OF Eu, Gd, AND Yb. Peter Brix. Z. Physik 132, 579-607(1952). (In German)

Hyperfine structure measurements of the Eu, Gd, and Yb spectra have been analyzed to determine the isotope shift constants of $Eu^{151}-Eu^{153}$, $Gd^{156}-Gd^{158}$, $Gd^{158}-Gd^{160}$, $Yb^{171}-Yb^{173}$, $Yb^{172}-Yb^{174}$, and $Yb^{174}-Yb^{176}$. A rule is given for the analysis of incompletely resolved nuclear-moment splitting of spectral lines.

NUCLEAR REACTORS

6452
Hanford Works
LIMITING EXTRAPOLATION LENGTH FOR AN INFINITE SLAB WITH REFLECTOR ON THE BASIS OF TWO-GROUP THEORY, by G. M. Muller. Mar. 7, 1951. 3p. (HW-20484)

NUCLEAR TRANSFORMATION

6453
Radiation Lab., Univ. of Calif., Berkeley
PHYSICAL ANALYSIS OF Be AND C DISINTEGRATION INDUCED BY 330 MEV PROTONS, by Walter H. Barkas and Helge Tyren. Aug. 19, 1952. 10p. (UCRL-1914)

The disintegration products of C and Be emerging from thin targets bombarded by an internal cyclotron beam of 330-Mev protons have been studied. The magnetic field of the cyclotron is employed for momentum analysis and nuclear track plates for detection and range analysis. On plotting radius of curvature versus range, various nuclear species are found to fall on identifiable loci. The relative abundances of the products and their momentum spectra are obtained. H, He, Li, and B products have been found, and their abundances tabulated. Alpha particles prove to be the most important charged particle product. Be yields significantly more tritium than does C. Some of the heavy products are found with very high momenta. (auth)

6454
Wisconsin Univ.
ELECTROSTATIC ANALYSIS OF NUCLEAR REACTION ENERGIES, II, by D. S. Craig, D. J. Donahue, and K. W. Jones. [nd] 17p. (AECU-2213)

Electrostatic analysis of incident and product particle energies has been used to measure the following ground state Q values: $O^{16}(d,\alpha)N^{14}$ (3.113 ± 0.0035 Mev), $B^{10}(p,He^3)Be^8$ (−0.536 ± 0.003 Mev), $B^{10}(p,\alpha)Be^7$ (1.147 ± 0.0025 Mev). The energy of the lowest level in B^{10} has been determined to be 719 ± 1.6 kev; that of Be^7 to be 430 ± 3 kev. Approximate cross sections are given for the above reactions and upper limits for $O^{16}(d,\alpha)N^{14*}$ (2.3-Mev level), and for $B^{10}(p,p')B^{10*}$ (2.2- and 1.8-Mev levels). (auth)

6455
(n,α) AND (n,p) REACTIONS OF IRON WITH SLOW NEUTRONS. H. Hänni and J. Rossel. Helv. Phys. Acta 25, 521-46(1952) Sept. 15. (In French)

The nuclear emulsion technique has been applied to the investigation of reactions with slow neutrons in Fe, one of several elements of middle mass which seem to have positive Q values for (n,α) and (n,p) processes. The irradiated plates, loaded with Fe-saccharosate or citrate, or in contact with layers of pure iron and imbedded in a paraffin block, show a (n,α) and presumably also a (n,p) effect. Alpha and proton tracks have been discriminated by grain counting. The range distribution of α tracks exhibits two groups at 16 ± 2.5 and 24 ± 2.0 μ with the corresponding Q values Q_1 = 4.5 ± 0.5 Mev and Q_2 = 5.7 ± 0.3 Mev. The slow-neutron flux, measured with plates loaded with Li and B, could be determined with an accuracy of a few points percent. The cross section for the total (n,α) effect has been found to be $5.4 \pm 0.8 \times 10^{-27}$ cm^2, that is, ~100 times greater than the semitheoretical expectation. Comparison of the measured efficiencies with the predicted relative probabilities and isotopic abundances suggests Fe^{56} for the first and Fe^{57} for the second α group. These results seem compatible with mass values of Ogata (Phys. Rev. 75, 200(1949)). (auth)

6456
MEASUREMENT OF THE RATIO OF THE CROSS SECTIONS OF MANGANESE ACTIVATION AND URANIUM FISSION BY THERMAL NEUTRONS. REDETERMINATION OF THE NEUTRON FLUX OF THE CHATILLON STANDARD. R. Barloutaud and A. Lévèque. J. phys. radium 13, 413-15 (1952) July-Aug.-Sept. (In French)

The σ_{Mn}/σ_U ratio for 0.025-ev neutrons was determined to be 3.057 ± 0.055, the $1/v$ cross sectional variation being assumed for the thermal region. Taking the value 3.915 ± 0.055 barns as the thermal fission cross section of natural U, the authors deduced the value 12.0 ± 0.3 barns for the activation cross section of Mn. The neutron flux of the Châtillon standard Ra-Be source was redetermined by Mn activation, this new cross section being taken into consideration.

6457
THRESHOLD FOR (γ,p) REACTION IN Be^9. B. L. Tucker and E. C. Gregg. Phys. Rev. 87, 907(1952) Sept. 1.

The betatron-determined threshold for the $Be^9(\gamma,p)Li^8$ reaction gives 16.93 ± 0.15 Mev, as compared to a theoretical value of 16.872 ± 0.008 Mev determined by mass-difference calculation.

6458
INELASTIC SCATTERING IN CONTINUUM THEORY. Otto Hittmair. Z. Physik 132, 553-8(1952). (In German)

A continuous level scheme is assumed for the compound nucleus in scattering processes. The principal difficulty in calculating the inelastic scattering cross section is avoided by consideration of the γ radiation emitted by the excited nucleus in returning to its ground state. Determination of the ratio of two cross sections for scattering processes involving different incident energies but equal γ radiations avoids the necessity for calculation of the γ transition probabilities. The ratio is spin-dependent. Numerical values are given for the Cd^{111} energy levels.

6459
DIRECTIONAL CORRELATION IN INELASTIC SCATTERING WITH SUBSEQUENT GAMMA EMISSION. Otto Hittmair. Z. Physik 132, 559-64(1952). (In German)

A general equation is derived for the angular distribution in the reaction $(a,a'\gamma)$, a and a' being any identical particles. Summation over the magnetic quantum numbers is carried out, using Racah coefficients, for the case in which correlation between the γ rays and the a particles is considered but the a' particles are not observed. Statistical assumptions are made for the levels of the compound nucleus, and a level of the excited initial nucleus is ascertained by γ-ray measurements of suitable energy. This formalism is applied to the $Cd^{111}(n,n'\gamma)$ reaction. Consideration of the γ radiation facilitates investigation of nuclear spins and parities by inelastic scattering. Directional-correlation measurements with γ rays are experimentally easier to carry out than are determinations of total cross sections.

6460
ABSOLUTE MEASUREMENT OF CROSS SECTIONS OF THE $Cu^{63}(\gamma,n)$ AND $C^{12}(\gamma,3\alpha)$ REACTIONS IN RELATION TO LITHIUM γ RADIATION. H. Glättli, O. Seippel, and P. Stoll. Helv. Phys. Acta 25, 491-9(1952) Sept. 15. (In German)

The absolute values of the $Cu^{63}(\gamma,n)$ and $C^{12}(\gamma,3\alpha)$ reactions induced by the Li 17.6-, 14.8-, and 12.5-Mev γ-ray mixture were determined with high precision to be $0.048 \pm 0.008 \times 10^{-24}$ and $1.75 \pm 0.25 \times 10^{-28}$ cm^2, respectively.

PARTICLE ACCELERATORS

6461
Sarah Mellon Scaife Radiation Lab., Univ. of Pittsburgh
PRECISION SCATTERING PROJECT REPORT NO. II. [ON] EQUIPMENT DESIGN AND PRELIMINARY RESULTS. May 1952. 63p. (NP-4005; Report No. 2)

Design and equipment of a shielded scattering laboratory built into the hillside behind the cyclotron chamber are described. An Al duct system transports the incident beam 31 ft through focusing and beam-analyzing magnets to the scattering chamber, and the charged particles from the reaction traverse an additional 10 ft of duct system through a second analyzing magnet to a scintillation detector. Details are included of the cyclotron room and shielded room design, the scattering room design, magnet design, and equipment for beam focusing and analysis, reaction particle analysis, positioning the pole tip, radiation detecting and counting, and magnetic field measurements. Data are included from preliminary measurements of energy levels in Al and Ni.

6462
Oak Ridge National Lab.
SPATIAL DISTRIBUTION OF CURRENT ON AN INTERNAL CYCLOTRON TARGET, by B. L. Cohen. July 1952. 8p. (ORNL-1348)

The spatial distribution of protons over an internal target in the ORNL 86-inch cyclotron was measured by activating carbon strips. Results for several operating conditions are shown, and their interpretation in terms of cyclotron theory is discussed. (auth)

6463
PHYSICAL OBSERVATIONS RELATING TO THE 2 MEV VAN DE GRAAFF ELECTROSTATIC GENERATOR AT WESTMINISTER HOSPITAL. C. W. Wilson and B. J. Perry. Brit. J. Radiology 25, 210-18(1952) April.

The 2-mev Van de Graaff generator installed at Westminister Hospital, London, England, is described and some of the physical measurements and observations made with it are summarized.

6464
A CASCADE GENERATOR IN WHICH HIGH-FREQUENCY IS USED FOR FILAMENT SUPPLY OF THE KENOTRONS. V. I. Popkov. Elektrichestvo, No. 10, 3-6(1951) Oct. (In Russian)

Design peculiarities of cascade generators in which high-frequency (396 kc) is used for filament supply of the kenotrons (Soviet-produced Kr-220's) are described. Two four-cascade generators were actually built, each having 16 kenotrons and a voltage of ±600 kv with respect to ground and 1200 kv between terminals.

RADIATION ABSORPTION AND SCATTERING

6465
Brookhaven National Lab.
COULOMB AND NUCLEAR INTERACTIONS OF COSMIC-RAY MESONS AND PROTONS IN LEAD, by W. L. Whittemore and R. P. Shutt. [nd] 29p. (BNL-1253)

A cloud-chamber experiment shows that positive and negative particles at sea level in the momentum range 0.3 to 3.1 bev/c scatter in 5 cm of Pb in the same manner. The experimental scattering distributions have a large-angle "tail" which agrees rather well with the theoretical distributions of Molière and of Snyder and Scott who assumed that the nucleus scatters like a point charge. These distributions should not be valid here because the charge distribution within the nucleus must be considered in detail for such energetic mesons. The recent calculation of Olbert specifically neglecting the scattering of particles which penetrate the nucleus predicts a much smaller probability for large-angle scattering than observed. A rough extrapolation of the calculations of Amaldi et al. to the case of Pb shows that it is possible to explain perhaps 10% of the observed scattering as due to inelastic electric scattering within the nucleus, if the radius of the electric charge on a proton is taken to be 2×10^{-14} cm. Negative particles observed at 3.4-km altitude scatter in Pb much the same as the sea-level particles. The scattering of positive particles observed at 3.4-km altitude indicates that protons in the momentum range 1 to 4.8 bev/c suffer a small amount of nuclear scattering in Pb corresponding to $(0.13 \pm 0.07)\sigma_g$, where σ_g is the geometrical cross section. All nuclear interactions combined give a total interaction cross section for Pb of $(0.38 \pm 0.09)\sigma_g$. These surprisingly small cross sections are compared with other data from the literature. (auth)

6466
INFLUENCE OF THE SPECTRUM OF GAMMA RADIATION ON THE TRANSITION (PASSAGE) EFFECT OF GAMMA RAYS. I. V. Estulin. Zhur. Eksptl'. i Teoret. Fiz. 22, 85-91(1952) Jan. (In Russian)

On a compensating apparatus consisting of two identical plane ionization chambers, the author measured the transition effect of γ rays. The phenomena connected with the passage of Ra and RdTh γ radiation through Al and Pb were picked out separately for the front and back walls of the ionization chamber. The transition (passage) effect of γ rays depends on the γ-radiation spectrum.

6467
MULTIPLE SCATTERING AND ENERGY LOSS OF FAST PARTICLES IN HIGH PRESSURE GASES. George F. O'Neill. Ph.D. Thesis, Fordham Univ., 1951.

The use of the high-pressure cloud chamber is described in investigating the multiple scattering and energy loss of fast particles in high-pressure gases (~200 atm.), in this

case H, He, and A. The experimentally found relation between average scattering angle and gas density is compared with the various theoretical ones in the literature.

6468
DISCRETE ENERGY LOSS OF 35-KEV ELECTRONS BY INTERACTION WITH ATOMS AND MOLECULES. G. Möllenstedt. Z. Naturforsch. a7, 465-70(1952) July. (In German)

Discrete energy losses of fast electrons (35 to 50 kev) in N_2, H_2, O_2, He, benzene, CO_2, H_2O, xylene, and ethyl ether were measured with an electrostatic velocity analyzer of high resolving power. These electrons apparently excited the same atomic energy levels as did 100-ev electrons.

6469
ELASTIC SCATTERING AND NEUTRALIZATION OF LOW VELOCITY HYDROGEN IONS IN ETHANE AND PROPANE. J. H. Simons and S. A. McAllister. J. Chem. Phys. 20, 1431-6(1952) Sept.

The low-velocity scattering of H^+, H_2^+, and H_3^+ in both ethane and propane have been measured at ion velocities of less than 150 volts. Ion neutralization was detected and measured for all three ions in both hydrocarbons and elastic scattering potential functions evaluated for all six interactions. The scattering of H ions in the first four members of the series of straight-chain saturated hydrocarbons can now be compared, and it is shown that they change in a systematic manner. (auth)

6470
RADIATION-ABSORBING GLASSES. Gordon F. Brewster and Norbert J. Kreidl. J. Am. Ceram. Soc. 35, 259-64 (1952) Oct.

Glasses of high x-ray, thermal-neutron, or combined x-ray and thermal-neutron absorptivity and satisfactory technological properties were developed: Pb Ta (Nb, Th) borate, phosphate, and germaniate glasses for x rays, Cd-Ta-Zr borates for thermal neutrons, and Pb Cd borates for their combination. These glasses were compared with known absorbers. (auth)

6471
CROSS SECTION FOR PAIR PRODUCTION IN RELATION TO NUCLEAR CHARGE FOR GAMMA RADIATIONS FROM Th(C + C″), RaC, AND Co^{60}. B. Hahn, E. Baldinger, and P. Huber. Helv. Phys. Acta 25, 504-20(1952) Sept. 15. (In German)

Dependence on Z of the pair-production cross section in the coulomb field of nuclei for γ rays of Th(C + C″) (Bi^{212} + Tl^{208}), RaC (Bi^{214}), and Co^{60} has been measured. Positive deviations from the Bethe-Heitler theory are found. These increase with decreasing energy of the γ rays and increasing atomic number.

6472
THE COULOMB SCATTERING OF DEUTERONS. J. B. French and M. L. Goldberger. Phys. Rev. 87, 899-900 (1952) Sept. 1.

Mathematical analysis is given of the Born approximation calculation of the ratio of the scattering by a point coulomb field to the Rutherford scattering, $d\sigma/d\sigma_R$. The use of the Born approximation is satisfactory only for $n = Ze^2/\hbar v \ll 1$; therefore, a more accurate mathematical demonstration is given showing that the deuteron structure plays no part in coulomb scattering when $n \gg 1$.

6473
MULTIPLE SCATTERING OF FAST PROTONS IN PHOTOGRAPHIC EMULSIONS. Martin J. Berger. Phys. Rev. 88, 59-70(1952) Oct. 1.

Measurements have been made of the multiple coulomb scattering of protons with energies of 337 ± 1 Mev and 218 ± 2 Mev in Ilford G-5 emulsions. A total of 261 tracks with a combined length of 130.4 cm were analyzed by the determination of the lateral multiple scattering deflections according to the "coordinate method." The results are summarized in terms of the customary scattering factors which, for a given cell length, indicate the proportionality of the average multiple scattering deflection to the quantity "charge/momentum × velocity" of the scattered particle. Scattering factors are given for cell lengths of 250, 500, 750, and 1000 microns. These results are compared with the predictions of various theories of multiple scattering, including those of Moliere, Snyder, and Scott, as well as a proposed extension of the theory of Goudsmit and Saunderson, which has the advantage of being directly and conveniently applicable to the analysis of lateral multiple scattering deflections. The predicted theoretical scattering factors are in fair agreement with the experimental values, but slightly larger; the discrepancies are either within, or just outside of, the limits of the experimental error (3 to 6%). (auth)

RADIATION EFFECTS

6474
Argonne National Lab.
ALPHA PARTICLE IONIZATION IN MIXTURES OF THE NOBLE GASES, by William P. Jesse and John Sadauskis. Aug. 1952. 5p. (AECU-2235; UAC-624)

The effect of impurities on the total ionization in He and A was studied. The effects, on the ionization produced per α particle, of adding extremely small quantities of A to pure He, A to Ne, and A to He and Ne are described.

6475
EFFECT OF RADIATION ON ELASTIC CONSTANTS. F. R. N. Nabarro. Phys. Rev. 87, 665-6(1952) Aug. 15.

An approximation used by Dienes in his calculation of the effect of interstitial ions and vacant lattice sites on the elastic constants of Cu and Na (Phys. Rev. 86, 228(1952)) is said to overestimate the difference between these effects. The criticism is answered by Dienes in Phys. Rev. 87, 666 (1952).

6476
INFLUENCE OF CONDITIONS OF EXCITATION ON THE LUMINESCENCE OF COLORED CRYSTALS OF ALKALI HALIDE COMPOUNDS IN THE ULTRAVIOLET PART OF THE SPECTRUM. M. L. Kats. Zhur. Eksptl'. i Teoret. Fiz. 22, 78-84(1952) Jan. (In Russian)

Results of an investigation into the influence of excitation conditions on the luminescence of alkali halide crystals (NaCl, KCl, and KBr) irradiated with x rays are reported. On the basis of new data concerning the absorption spectrum of these crystals in the ultraviolet region the mechanism of their luminescence is considered.

RADIOACTIVITY

6477
Engineering Research Inst., Univ. of Mich.
THE USE OF PALLADIUM-109 AS A MULTI-CURIE BETA-RAY SOURCE, by W. W. Meinke, A. H. Emmons, and J. V. Nehemias. [nd] 14p. (AECU-2217)

Multi-curie sources of pile-produced Pd^{109} have been utilized experimentally. The hazard to personnel is minimal because of the short half life and relative metabolic and chemical inertness of the material. A discussion of the use of pile-irradiated palladium metal as an intense β-ray source is presented. (auth)

6478
Argonne National Lab.
RADIATIONS OF 6.7d U^{237}, by F. Wagner, Jr., M. S. Freedman, D. W. Engelkemeir and J. R. Huizenga. Aug. 1952. 18p. (ANL-4887; AECD-3414; ANL-OCS-275)

This report was issued as AECD-3414 and abstracted in Nuclear Science Abstracts as NSA 6-4981.

6479
Brookhaven National Lab.
A NOTE ON THE GEOMETRICAL CORRECTION IN ANGULAR CORRELATION MEASUREMENTS, by E. L. Church and J. J. Kraushaar. [nd] 6p. (BNL-1244)

A simple procedure for correcting angular correlation data directly in terms of the experimental resolution curve is presented. It is indicated that the corrections so introduced are greater than has heretofore been assumed.

6480
MEASUREMENT OF THE L-CAPTURE/K-CAPTURE RATIO OF Kr^{79}. Pierre Radvanyi. Compt. rend. 235, 428-30(1952) Aug. 11. (In French)

The ratio of L to K capture in Kr^{79} was measured by counting the tracks of K and L Auger electrons in a specific volume of a cloud chamber. The result, $L/K = 0.27 \pm 0.09$, is much greater than that given by theory (Rose and Jackson, Phys. Rev. 76, 1540(1949)).

6481
GAMMA-RAYS FROM CADMIUM 117. A. H. W. Aten, Jr. and M. Boelhouwer. Physica 18, 651(1952) Aug.-Sept.

The half life of Cd^{117}, produced by deuteron bombardment of natural Cd, was measured by γ-ray absorption in Pb to be 2.9 ± 0.1 hr. The energy of the penetrating γ rays was 1.2 Mev, but this may be an average of several energies. The presence of low-energy photons could not be determined because of interference from Cd^{111} and Cd^{115}. The number of 1.2-Mev γ rays per β particle in Cd^{117} was not far from unity.

6482
A STUDY OF THE EXHALATION OF RADON FROM THE EARTH. Thomas L. Cullen, S. J. Ph. D. Thesis, Fordham Univ., 1951.

Studies were made of the exhalation of Rn from the earth at two different locations: Fordham University, and Woodstock College, Woodstock, Maryland. The rate at which exhalation occurs was found to depend first on the radium content of the particular type of soil, secondly on other qualities of the soil such as porosity, and finally on weather conditions.

6483
RADIOACTIVITY OF THE ŁOWICZ METEORITE. S. Pieńkowski and E. Kirszenstein. Compt. rend. classe sci. mat. et nat., Acad. polon. sci., 11-12(1951) Mar.-Apr. (In French)

The α radioactivity of the Łowicz, Poland, iron meteorite was measured with nuclear plates. A specific activity of 0.0958 α particles/cm^3/sec was found. Assuming that the concentration of Th and its derivatives is twice that of U and its derivatives, the authors deduce the concentration of radioactive substances to be $\sim 4 \times 10^{-6}$ g/g, the same order of magnitude as in magmatic rocks and stony meteorites.

6484
INTERNAL CONVERSION OF MAGNETIC DIPOLE RADIATION IN L_I SHELL TAKING INTO ACCOUNT THE FINITE SIZE OF THE NUCLEUS. L. A. Sliv and M. A. Listengarten. Zhur. Eksptl'. i Teoret. Fiz. 22, 29-33(1952) Jan. (In Russian)

The coefficient of conversion of magnetic dipole radiation of the L_I-shell is calculated, taking into account the finite size of the nucleus. Results for Z = 83 are presented graphically. It is found that the ratio of the coefficients of conversion, $\beta_K^{(1)}/\beta_{L_I}^{(1)}$, equals ~8.5. The three γ lines of RaC (Bi^{214}) are analyzed.

THEORETICAL PHYSICS

6485
GENERAL THEORY OF DAMPING PHENOMENA IN NONSTATIONARY PROCESSES. II. SEPARATION OF VIRTUAL STATES; CORRECTIONS OF SECOND ORDER. E. Arnous and K. Bleuler. Helv. Phys. Acta 25, 581-98(1952) Sept. 15. (In German)

In a continuation of a previous paper (NSA 5-6552) the radiative corrections to the form and breadth of an emission line are treated. General expressions for these corrections are obtained with the help of a canonical transformation which eliminates the virtual processes. This makes use essentially of a "finite energy shell" the extension of which is interpreted as the extension of the exciting spectrum. Some of the corrections depend explicitly on the excitation conditions. It is proved that, to a very great accuracy, the displacement of the line maximum is given by the level shifts ($\approx$ self energies) as usually calculated (independent of the excitation conditions). The corrections to the classical line shape are worked out explicitly, as far as the e^2 effects are concerned. (auth)

6486
A NEW VARIATION METHOD FOR APPROXIMATE CALCULATION OF EIGENVALUES OF HERMITIAN OPERATORS. Hans J. Maehly. Helv. Phys. Acta 25, 547-68(1952) Sept. 15. (In German)

A new variation procedure for the approximate computation of eigenvalues is developed. It is well known that the RITZ method will give upper bounds for the lowest eigenvalues; by help of the new procedure however, upper and lower bounds can be calculated (even for operators whose spectrum extends from $-\infty$ to $+\infty$), if the positions of the neighboring eigenvalues can roughly be estimated. As an example, the two lowest eigenvalues λ_1, λ_2 of the differential equation (arising in the deuteron problem)

$$\frac{d^2\Phi}{dx^2} - \kappa^2\Phi + \lambda\frac{e^{-x}}{x}\Phi = 0$$

are calculated with high accuracy. (auth)

6487
APPLICATION OF THE METHOD OF THE SELF-CONSISTENT FIELD TO THE NUCLEUS. A. Kompaneets. Doklady Akad. Nauk S.S.S.R. 85, 301-4(1952) July 11. (In Russian)

Certain problems in energy and volume stability of the nucleus in its interaction with a nucleon are treated by application of the self-consistent field.

6488
THE INTRINSIC PARITY OF ELEMENTARY PARTICLES. G. C. Wick, A. S. Wightman, and E. P. Wigner. Phys. Rev. 88, 101-5(1952) Oct. 1.

The limitations to the concept of parity of quantum-mechanical states and, in particular, of intrinsic parity of elementary particles are discussed. These limitations are shown to follow from "superselection rules," i.e., from restrictions on the nature and scope of possible measurements. The existence of such superselection rules is proved for the case of spinor fields; it is also conjectured that a superselection rule operates between states of different total charge. (auth)

NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This list in the individual issues of Volume 6 supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 5, No. 24. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA. In general, this list refers only to those reports abstracted in issues preceding the current one. Orders for items for which prices are indicated should be directed to:

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Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948
AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)
AECU - To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-871, this code is applied only to reports carrying no other recognized code designation.)

Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability
AECD-2633	NSA 3-762	Natl. Bur. Standards (U. S.), Applied Math. Ser., No. 13(1952)
3133	5-3543	Phys. Rev. 85, 429-31(1952)
3374	6-3845	Phys. Rev. 88, 71-2(1952)
3397	6-4522	J. Chem. Phys. 20, 1493-5(1952)
3403	6-4444	J. Chem. Phys. 20, 1490-1(1952)
AECU-1614	5-6399	Phys. Rev. 88, 83-90(1952)
1734	6-543	Anal. Chem. 24, 1467-71(1952)
1784	6-762	Arch. Biochem. Biophys. 39, 355-69(1952)
1829	6-1492	Rev. Sci. Instruments 23, 507-8(1952)
1843	6-1650	Anal. Chem. 24, 1482-3(1952)
1884	6-2133	Rev. Sci. Instruments 23, 483-4(1952)
1905	6-2431	Rev. Sci. Instruments 23, 502-3(1952)
1907	6-2432	Rev. Sci. Instruments 23, 503-4(1952)
1953	6-2856	Phys. Rev. 88, 113-27(1952)
1963	6-3353	Rev. Sci. Instruments 23, 508(1952)
1964	6-3390	Phys. Rev. 87, 612-18(1952)
2003	6-3512	Proc. Soc. Exptl. Biol. Med. 80, 503-4 (1952)
2016	6-3525	Acta Cryst. 5, 683-4(1952)
2039	6-3894	J. Lab. Clin. Med. 40, 355-6(1952)
2056	6-3893	J. Lab. Clin. Med. 40, 342-54(1952)
2067	6-4382	J. Nutrition 47, 561-9(1952)
2068	6-4383	J. Nutrition 47, 571-81(1952)
2107	6-4982	Phys. Rev. 87, 901(1952)
2118	6-4978	Phys. Rev. 88, 106-12(1952)
2141	6-5695	Gen. Elec. Rev. 55, 16-20(1952)
ANL-4723	6-1415	J. Chem. Phys. 20, 1443-7(1952)
4645	5-5089	J. Chem. Phys. 20, 1438-42(1952)
BNL-1143	6-2855	J. Am. Chem. Soc. 74, 4944-5(1952)
1147	6-3516	J. Chem. Phys. 20, 1400-2(1952)
1171	6-4621	Phys. Rev. 87, 886-8(1952)
1186	6-4416	J. Chem. Phys. 20, 1495-6(1952)
ISC-232	6-4010	J. Am. Chem. Soc. 74, 4751-5(1952)
NP-3672	6-2589	J. Am. Chem. Soc. 74, 4784-7(1952)
3878	6-4641	Phys. Rev. 88, 131-2(1952)
NP-3901	NSA 6-4045	Trans. Am. Soc. Mech. Engrs. 72, 1007-74(1950)
NYO-1650	6-5266	Lab. Invest. 1, 312-23(1952)
3042	6-2467	Phys. Rev. 88, 9-14(1952)
3043	6-2484	Phys. Rev. 88, 1-8(1952
3044	6-2505	Phys. Rev. 88, 15-19(1952)
3048	6-3004	Rev. Sci. Instruments 23, 476-82(1952)
3203	6-5670	Phys. Rev. 87, 900-1(1952)
3584	6-4436	J. Am. Chem. Soc. 74, 4723-5(1952)
UCLA-178	6-1500	Rev. Sci. Instruments 23, 504-5(1952)
197	6-3734	Blood 7, 959-77(1952)
UCRL-811	5-325	J. Am. Chem. Soc. 73, 5058(1951)
935	5-383	J. Am. Chem. Soc. 74, 2423(1952)
962	5-2155	J. Am. Chem. Soc. 74, 2425-7(1952)
1104	5-3474	Rev. Sci. Instruments 23, 127-9(1952)
1198	5-3647	Arch. Biochem. Biophys. 35, 346-51(1952)
1300	5-5152	J. Am. Chem. Soc. 74, 2416-17(1952)
1302	5-5154	J. Am. Chem. Soc. 74, 2420-2(1952)
1327	5-5155	J. Am. Chem. Soc. 74, 2418(1952)
1366	5-5034	J. Expti. Botany 2, 316-20(1951)
1403	5-7006	J. Am. Chem. Soc. 74, 4789-91(1952)
1411	5-5036	J. Bact. 63, 525-31(1952)
1432	5-6278	Nucleonics 9, No. 6, 24-8(1951)
1470	6-386	Phys. Rev. 84, 1069-70(1951)
1502	6-14	Nature 169, 455-7(1952)
1514	6-736	Phys. Rev. 85, 369-70(1952)
1519	6-361	Phys. Rev. 86, 110-17(1952)
1527	6-390	Phys. Rev. 86, 59-63(1952)
1600	6-852	J. Am. Chem. Soc. 74, 1857(1952)
1685	6-2574	Nature 170, 200(1952)
1721	6-2896	J. Am. Chem. Soc. 74, 2523(1952)
1725	6-3108	Phys. Rev. 88, 129-31(1952)
1748	6-3204	Metabolism 1, 254-8(1952)
1749	6-4016	J. Am. Chem. Soc. 74, 4484-6(1952)
UR-197	6-4715	Arch. Ind. Hyg. Occupational Med. 6, 93-104(1952)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 18B, page "SUPPLEMENT 1".

$_1H_1^2$	q $(2.738 \pm 0.014) \times 10^{-3}$ M	H. G. Kolsky et al., Phys. Rev. 87, 395 (1952); 83, 1061 (1951).
$_2He_4^6$	τ 0.86 ± 0.03^S β^- 3.50 s	R. K. Sheline, Phys. Rev. 87, 557(1952). Li^7(≤50 Mev γ,p). C. S. Wu et al., Phys. Rev. 87, 1140(1952). Be(n,α).
$_3Li_1^4$	No activity observed with $0.025^S < \tau < 1^m$ from Li(≤50 Mev γ)	R. K. Sheline, Phys. Rev. 87, 557(1952).
$_3Li_3^6$	Levels 2.18 Li^6(p,p) Li^7(p,d) 3.7 Li^7(p,d) scin E_p = 18.3	W. Franzen, J. G. Likely, Phys. Rev. 87, 667(1952); 87, 205A(1952).
$_3Li_4^7$	Levels Li^7(p,p) 4.56 scin broad 6.56 E_p = 18.3	W. Franzen, J. G. Likely, Phys. Rev. 87, 667(1952); 87, 205A(1952).
$_3Li_5^8$	τ 0.85 ± 0.02^S	R. K. Sheline, Phys. Rev. 87, 557(1952). Be(≤50 Mev γ); B(≤50 Mev γ).
$_3Li_6^9$	τ 0.19 ± 0.05^S β^-	R. K. Sheline, Phys. Rev. 87, 557(1952). B(≤50 Mev γ).
$_4Be_6^{10}$	β^- 0.555 s C_1T, C_2A, C_3T, C_3V fit spectral shape	L. Feldman, C. S. Wu, Phys. Rev. 87, 1091(1952).
$_5B_3^8$	τ 0.61 ± 0.11^S β^+	R. K. Sheline, Phys. Rev. 87, 557(1952). B(≤50 Mev γ); C(≤50 Mev γ).
$_5B_5^{10}$	Resonances Be^9(p,γ) E_0 Γ Level 0.336 0.175 6.79 EA 0.492 0.110 6.93	S. E. Hunt, Phys. Rev. 87, 902(1952).
	d,n(θ) Be^9(d,n) g.s. and first 4 excited states have even parity ppl	J. S. Pruitt et al., Phys. Rev. 87, 534 (1952).
$_5B_6^{11}$	Levels N^{14}(n,α) 2.1 6.7 8.5 cc 4.4 7.3 8.9 5.0 8.0 11.8 E_n = 14.1	A. B. Lillie, Phys. Rev. 87, 716(1952).
$_6C_6^{12}$	Resonance B^{11}(p,γ) E_0 Γ scin 0.670 0.39 Level* Be^9(α,n) ~7 cc *pair emitting	L. W. Cochran et al., Phys. Rev. 87, 672 (1952). G. Harris, W. T. Davies, Proc. Phys. Soc. (London) A65, 564(1952).
$_6C_7^{13}$	Levels C^{12}(d,p) 3.09 6.92 8.03 ppl 3.88 7.25 8.14 5.23 7.58 8.35 5.42 7.75 8.55 5.77 7.87 8.75 6.36 E_d = 7.86	J. Catalá, F. S. Perez, Anales real soc. espan. fis. y quim. 47A, 225 (1951). J. Catalá et al., ibid 48A, 73 (1952).
	Levels O^{16}(n,α) 3.0 single 3.7 cc E_n = 14.1	A. B. Lillie, Phys. Rev. 87, 716(1952).
	Q's B^{10}(α,p) 0.63, 0.00 −0.55, −1.75 ppl	H. Slätis et al., Arkiv för Fysik 3, 315(1952); Phys. Rev. 81, 641(1951).
N	σ_S coh 11.1 (+)	S. W. Peterson, H. A. Levy, Phys. Rev. 87, 462(1952).
$_7N_7^{14}$	σ(14.1 Mev n,x) $\Sigma\sigma$ for p, d, and t 0.100 σ(14.1 Mev n,2α)Li^7 0.015 Values based on σ_S(H) = 0.675	A. B. Lillie, Phys. Rev. 87, 716(1952).
$_7N_9^{16}$	Levels O^{16}(n,p) 0.3? 1.7 2.6 cc E_n = 14.1	A. B. Lillie, Phys. Rev. 87, 716(1952).

$_8O^{16}_9$	σ(14.1 Mev n,p) cc 0.035 σ(14.1 Mev n,d) 0.015 σ(14.1 Mev n,α) 0.310 Values based on σ_S(H) = 0.675	A. B. Lillie, Phys. Rev. 87, 716(1952).
$_9F^{17}_8$	τ 60 ± 1^s	R. J. Horsley et al., Phys. Rev. 87, 756 (1952).
$_9F^{19}_{10}$	μ 2.6279 I	G. J. Bene, Helv. Phys. Acta 24, 367 (1951).
$_9F^{20}_{11}$	Levels F^{19}(d,p) 1.1 ppl 2.5 3.3 3.9	Y. A. Nemilov, Izvest. Akad. Nauk USSR Ser. Fiz. 14, 319(1950); Chem. Abs. 45, 465i(1951).
$_{11}Na^{24}_{13}$	Levels Na^{23}(d,p) 0.7 ppl 1.7	Y. A. Nemilov, Izvest. Akad. Nauk USSR Ser. Fiz. 14, 319(1950); Chem. Abs. 45, 465i(1951).
	Pair $e^+e^-(\theta)$ for 2.76γ consistent with E2	K. Siegbahn, Arkiv för Fysik 4, 223 (1952).
$_{12}Mg^{25}_{13}$	Levels Mg^{24}(d,p) 0.7 ppl 1.7 2.3	Y. A. Nemilov, Izvest. Akad. Nauk USSR Ser. Fiz. 14, 319 (1950); Chem. Abs. 45, 465i(1951).
$_{13}Al^{27}_{14}$	Rel σ(n,γ + n,p) E_n = 2.3 – 3.1 Mev	S. Yamabe et al., J. Phys. Soc. Japan 7, 140(1952).
$_{13}Al^{28}_{15}$	Levels Al^{27}(d,p) 1.1 ppl 2.4 3.7 5.2	Y. A. Nemilov, Izvest. Akad. Nauk USSR Ser. Fiz. 14, 319(1950); Chem. Abs. 45, 465i(1951).
$_{14}Si^{29}_{15}$	Levels Si^{28}(d,p) 1.3 4.4 ppl 2.1 4.8 3.1 5.4 3.6 6.2	Y. A. Nemilov, Izvest. Akad. Nauk USSR Ser. Fiz. 14, 319(1950); Chem. Abs. 45, 465i(1951).
$_{15}S^{31}_{15}$	τ 2.66^s	R. N. Haslam et al., Can. J. Physics 30, 257(1952).
$_{15}S^{32}_{16}$	Levels P^{31}(d,n) 0.5 3.3 4.9 ppl 1.5 3.8 5.2 2.2 4.1 5.5 2.7 4.5 E_d = 1.6	S. C. Snowdon, Phys. Rev. 87, 1022(1952); 86, 630A(1952).
$_{17}Cl^{36}_{19}$	β^- 0.714 s C_{2T}, C_{2V} fit spectral shape	L. Feldman, C. S. Wu, Phys. Rev. 87, 1091(1952).
$_{18}A^{37}_{19}$	Monoenergetic recoils of 9.7 ev observed in K capture	G. W. Rodeback, J. S. Allen, Phys. Rev. 86, 446(1952).
$_{18}A^{38}_{20}$	σ(th n,γ)265^yA 0.8	S. Katcoff, Phys. Rev. 87, 886(1952).
$_{18}A^{40}_{22}$	σ(th n,γ)1.83^hA 0.53	S. Katcoff, Phys. Rev. 87, 886(1952).
$_{18}A^{41}_{23}$	τ 1.83^h σ(th n,γ)3.5^yA 0.06	S. Katcoff, Phys. Rev. 87, 886(1952).
$_{18}A^{42}_{24}$	τ $>3.5^y$ p $12.5^h K^{42}$	S. Katcoff, Phys. Rev. 87, 886(1952).
$_{19}K^{40}_{21}$	Relative isotopic abundance 0.0118%	C. Reuterswärd, Arkiv för Fysik 4, 203(1952).
	β^- 1.325 s C_{3T}, C_{3A}, C_{4T}, C_{4V} fit spectral shape	L. Feldman, C. S. Wu, Phys. Rev. 87, 1091(1952).
$_{21}Sc^{46}_{27}$	2 γ's of ~0.98 in cascade with 1.33 γ $\gamma\gamma$ Co^{60} comparison; scin	B. Hamermesh et al., Phys. Rev. 87, 528 (1952). Ti(14 Mev n,p).
V	σ_S coh 0.03 (–)	S. W. Peterson, H. A. Levy, Phys. Rev. 87, 462(1952).
$_{23}V^{48}_{25}$	$\gamma\gamma(\theta)$ consistent with I = 4,2,0	P. S. Jastram, C. E. Whittle, Phys. Rev. 87, 1133(1952). Ti(d); chem.
$_{23}V^{50}_{27}$	μ +3.3406 I assuming $I(V^{50})$ = 6	H. E. Walchli, H. W. Morgan, Phys. Rev. 87, 541(1952).
$_{23}V^{51}_{28}$	μ +5.1402 I function of chemical compound	H. E. Walchli, H. W. Morgan, Phys. Rev. 87, 541(1952).
$_{23}V^{52}_{29}$ 2.6^m	β^- 2.0 a	O. Bruna, Anz. Akad. Wiss. Wien, Math.-naturw. Klasse 94 (1950).
$_{24}Cr^{51}_{27}$	τ 27.8 ± 0.3^d γ 8% 0.32 scin No other γ γX e^-/x ray = 3.0×10^{-4}	W. S. Lyon, Phys. Rev. 87, 1126(1952).
$_{24}Cr^{53?}_{29}$	Fe(n,α) ~300 α tracks found with th n's. E_α ~4.5 ppl	H. Hänni, J. Rossel, Helv. Phys. Acta 25, 521(1952).
$_{24}Cr^{54?}_{30}$	Fe(n,α) ~100 α tracks found with th n's. E_α ~5.7 ppl	H. Hänni, J. Rossel, Helv. Phys. Acta 25, 521(1952).
Co	σ_t(0.025 ev) 38.7(extrapolated) σ_t(0.03 – 1.2 ev) graph	S. Bernstein et al., Phys. Rev. 87, 487 (1952).
$_{27}Co^{60}_{33}$	β^- 0.306 sl γ (1.17) ce^- $\alpha = 1.72 \times 10^{-4}$ (1.33) $\alpha = 1.24 \times 10^{-4}$	C. Y. Fan, Phys. Rev. 87, 252(1952).

$_{27}Co^{60}_{33}$	$\gamma\gamma(\theta)$ inconsistent with I = 4,2,0 τ(1.33 level)<10^{-11}s from $\gamma\gamma(\theta) \neq$ f(external H)	H. Aeppli et al., Phys. Rev. 87, 379 (1952).
$_{28}Ni^{58}_{30}$	σ_s coh 27	S. Bernstein et al., Phys. Rev. 87, 487 (1952).
$_{28}Ni^{61}_{33}$	$Zn^{64}(n,\alpha)$ 15 α tracks observed with th n's. E_α ~6.6 ppl	H. Faraggi, R. Bernas, Compt. rend. 234, 1684 (1952).
$_{28}Ni^{64}_{36}$	$Zn^{67}(n,\alpha)$ 5 α tracks found with th n's. E_α ~7.5 ppl	H. Faraggi et al., Compt. rend. 235, 425.
$_{29}Cu^{63}_{34}$	$\sigma(n,\gamma)$ proportional to 1/E E_n = 2.3 – 3.1 Mev	S. Yamabe et al., J. Phys. Soc. Japan 7, 140(1952).
$_{29}Cu^{66}_{37}$	γ 1.05 scin	D. Maeder, P. Preiswerk, Helv. Phys. Acta 24, 625 (1951).
$_{30}Zn^{65}_{35}$	β^+ 0.32 sπ K/β^+ = 41	T. Yuasa, Compt. rend. 235, 366 (1952).
$_{31}Ga^{67}_{36}$	γ ~100%* 0.092 sl;ce$^-$, 1.3% 0.185 scin 0.2% 0.296 0.04% 0.378 No [e$^-$(0.092γ)][e$^-$(0.185γ)] No [e$^-$(0.092γ)][e$^-$(0.296γ)] $\gamma\gamma$	K. Siegbahn, Arkiv för Fysik 4, 223 (1952). Zn^{64}(d,n); chem. *Relative %'s of ce$^-$'s.
$_{33}As^{73}_{40}$	γ 84%* 0.0135 sl;ce$^-$ K : L : M = <0.5 : 1 : 0.19 100%* 0.0539 K : L + M = 1 : 0.18 ~0.1%* ~0.081? [e$^-$(0.0135γ)][e$^-$(0.0539γ)] rate suggests 0.0539γ delayed	S. Johansson, Arkiv för Fysik 4, 273 (1952). Ge(6 Mev d); chem., ms. *Relative %'s of ce$^-$'s.
Kr	Relative abundances ms 78 0.353% 80 2.29% 82 11.58% 83 11.51% 84 56.95% 86 17.31%	O. A. Schaeffer, J. Chem. Phys. 168, 18(1950). Used magnetic scanning.
$_{34}Kr^{79}_{43}$ 34^h	Auger e$^-$/β^+ = 6 cc	P. Radvanyi, Compt rend. 235, 289 (1952).
	L Auger e$^-$/K Auger e$^-$ = 1.68 cc	P. Radvanyi, Compt rend. 235, 428 (1952).
$_{36}Kr^{87}_{51}$	β^- 25% 1.27 sl 75% 3.63 γ 0.405 scin 1.89 ~2.3	S. Thulin, Phys. Rev. 87, 684(1952). Fission; ms.

Q's Between Ground States

$Li^6(p,\alpha)He^3$	+4.015	± 0.006	E. R. Collins et al., Nature 167, 682(1951).
$Li^7(p,\alpha)He^4$	+17.325	± 0.013	
$Be^9(\gamma,p)Li^8$	−16.93	± 0.15	B. L. Tucker, E. C. Gregg, Phys. Rev. 87, 907(1952).
$Be^9(d,n)B^{10}$	+4.44	± 0.04	J. S. Pruitt et al., Phys. Rev. 87, 534(1952).
$N^{15}(p,\alpha)C^{12}$	+4.960	± 0.006	E. R. Collins et al., Nature 167, 682(1951).
$C^{12}(d,p)C^{13}$	+2.729	± 0.009	W. M. Gibson, J. Catalá, Anales real soc. espan. fis. y quim. 46A, 307 (1950).
$N^{14}(n,p)C^{14}$	+0.609	± 0.005	R. Ishuwari, K. Yuasa, Memoirs Coll. Sci. Univ. Kyoto. A26, 151 (1950).
$F^{19}(\gamma,2n)F^{17}$	−19.4		R. J. Horsley et al., Phys. Rev. 87, 756(1952).
$F^{19}(\gamma,n)F^{18}$	−10.7		
$Al^{27}(\alpha,p)Si^{30}$	+2.3	± 0.4	H. Slatis et al., Arkiv för Fysik 3, 315(1952); Phys. Rev. 81, 641(1951).
$S^{32}(\gamma,n)S^{31}$	−15.0	± 0.1	R. N. H. Haslam et al., Can J. Physics 30, 257(1952).
$P^{31}(d,n)S^{32}$	+6.2		S. C. Snowdon, Phys. Rev. 87, 1022(1952).